VOL. 16. NO. 4. REGISTERED IN U. S. PATENT OFFICE APRIL, 1918

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THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW

Vol. 16 NEW YORK, APRIL, 1918. No. 4

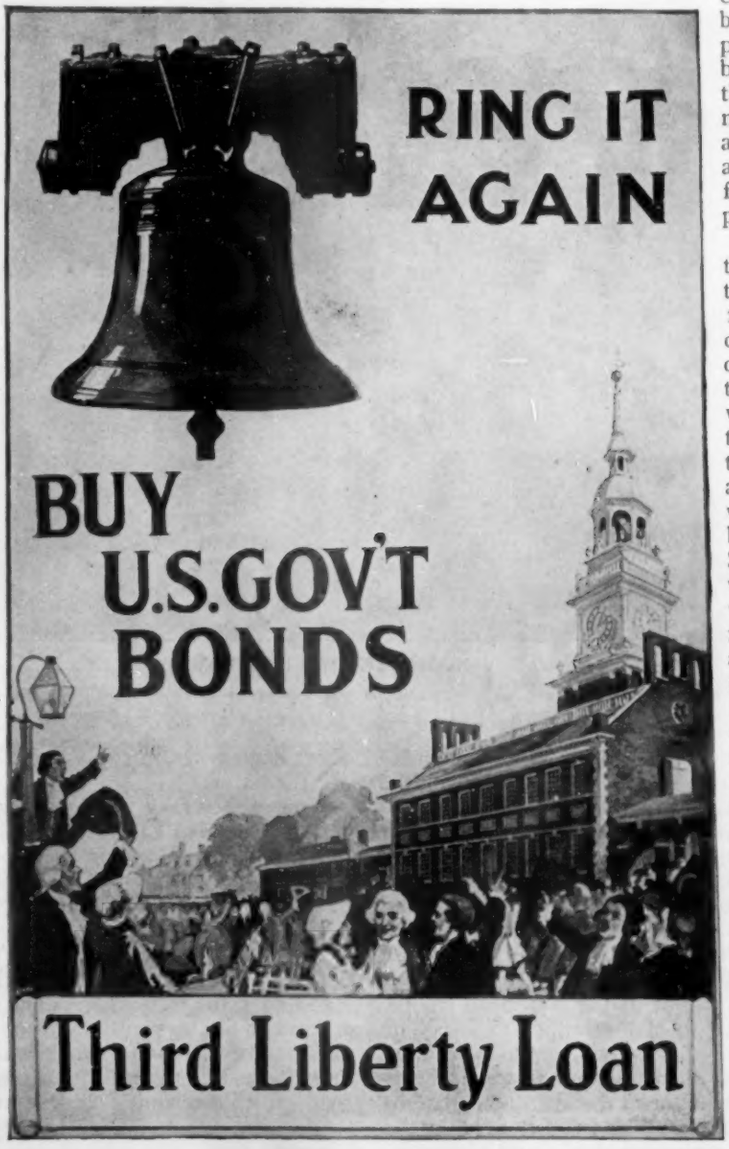
THIRD LIBERTY LOAN

TREMENDOUS DRIVE OF THREE BILLION ($) STRONG AGAINST MILITARISM IS NOW ON THROUGHOUT THE UNITED STATES.

BY PROF. ALBERT BUSHNELL HART, OF HARVARD UNIVERSITY.

LIBERTY LOAN THROUGHOUT THE LAND.*

"Proclaim liberty throughout all the land unto all the inhabitants thereof." So runs the legend on the Liberty Bell, which by a favorite tradition pealed out to the world the tidings of the birth of the United States of America on that famous July 4, 1776. We thought that message had gone out once for all; that freedom in the United States was a rock of Gibraltar that could not be scaled, nor penetrated nor moved. We have thought that the old days of national sacrifice and anxiety were forever passed. What so strong, so permanent, so vigorous, so dominant as government of the people in these United States?



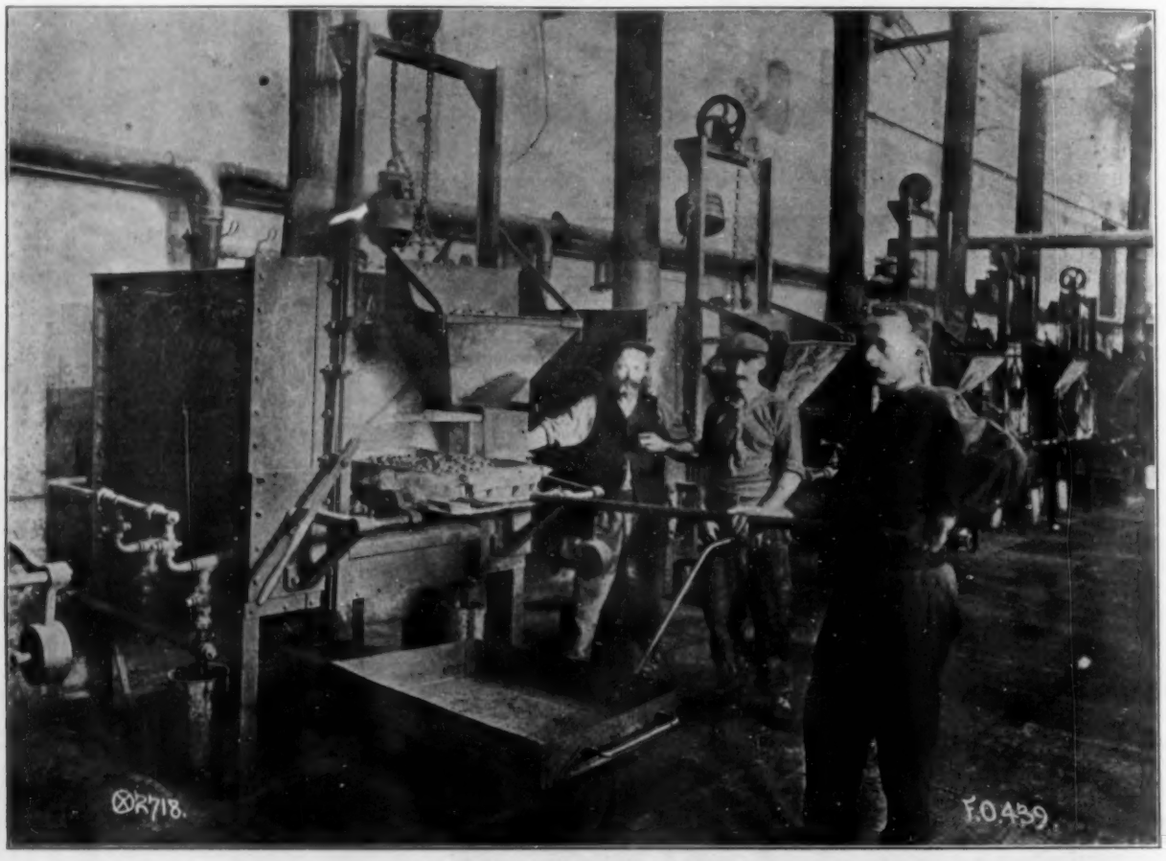
If the American Revolution had been only bell ringing and the passage of resolutions, we should not now be the foremost Republic of the world, nor any other kind of a republic. The Declaration of Independence was a bold statement of liberty which had still to be made good. The heroes of the Revolution knew how to watch as well as to pray, how to march as well as to resolve. The Declaration of Independence is a mighty force in the world because, when the country called, soldiers sprang into the ranks. Liberty had to be spelled out by such big capital letters as Lexington, Saratoga; Monmouth, Illinois; Bennington, Eutaw, Rocky Mount, Trenton and Yorktown. Liberty came not because men wished it, but because they compelled it. Still a poor backwoods community, the three million Continentals defied, fought, and with the unforgetable aid of France, defeated a great world power.

The hard fighting in the field won only half the battle. Our forefathers were able to "proclaim liberty throughout the land" because they found the sinews of war. It was one thing to raise the flag, another to raise troops and still another to "raise the wind." There was not a bank in the United States till the Revolution was nearly over, and few were the people who had money enough to lend to anybody, yet that three millions, of whom a fourth were slaves who could have no property, somehow induced the people of the country to turn to their small susplus of provisions, clothing and military supplies and take for it the obligations of the government, which toward the end of the dark period of the Revolution seemed little likely ever to be paid. They furnished about $65,000,000 in taxes, contributions and supplies, and at the end of the war the national

*From Liberty Loan Publicity Committee, 2d Federal Reserve District.

debt and the state debts incurred in behalf of the Revolution were, including arrears of interest, $70,000,000, which was then about $20 a head on the population—man, woman and child, whites, Indians and negroes, seamen, farmers, plantation slaves as they ran.

"Proclaim liberty throughout all the land unto all the inhabitants thereof." What those people did in their poverty and remoteness, we must do on a vaster scale or else forever sink beneath their patriotic level. We live in a time when every state and every country is rich in comparison with those national beginnings. Our land abounds in wealthy banks, corporations and individuals. A debt of $200 per capita for 100,000,000 people is only $20,000,000,000, which will be a lighter burden and more quickly extinguished than the Revolutionary debt.



A FRENCH CARTRIDGE FACTORY.

Rows upon rows of steel ovens are used day and night in munitions plants to complete the manufacture of these cartridges for use of the fighters at the front . . . Toulon, France. (French Official. Committee on Public Information.)

It is not specie that the government is demanding—few of us carry "fifteen dollars in my inside pocket" in the form of hard silver dollars or golden eagles. It asks us to share our credits; that is, our power of commanding food and weapons and uniforms and aeroplanes and submarines and merchant ships and gas masks and all the numerous things that Uncle Sam must have. Make no mistake; this is not a question of whether we feel like subscribing to a loan any more than a question of whether we feel like receiving the news of a break on the war front and the capture or retreat of the American troops.

The nation is compelled to choose either to spend or to be spent. There is only one possible way to end the war to the honor and safety of the United States, and that is to fight for it. Our sons fight in the army, our daughters fight in the Red Cross, we elders must fight in the safe deposit boxes and mortgage deeds and sheets of securities. We must fight with Liberty Bonds.

In the days when the French were in the habit of recruiting troops in Switzerland, there was a saying, "No money, no Swiss!" Nowadays it is, "No money, no Yank!" For unless you subscribe to the loan your son cannot be trained or equipped, or fed or transported overseas, or carried to the front, or protected by a barrage of artillery fire, or put where he can attack the enemy.

The battle is going on from day to day in the national banks and the savings banks and the trust companies and the treasuries of the fraternities and the clubs and the churches and the restaurants, just as much as in northern France or Belgium. No one soldier can win at the front, nor a hundred thousand together. It would take a million, but if every one of that million hangs back, there is no army, nor war—nothing but shame and misery for the nation.

You cannot save your country alone by your subscription to the third Liberty Loan, but you can unite with a million others. Do your duty and expect and urge others to do theirs. That makes a victorious army of people pouring in their rattling dollars, as the boys at the front hurl hand-grenades.

"All the inhabitants thereof!" That is what the Liberty Bell aroused. Not the soldier only, not merely the Red Cross, the Y. M. C. A., and the other noble co-workers and co-fighters with the troops. You banker, investor, manufacturer, foundryman; you doctor, lawyer, teacher, scientific man, engineer; you farmer, business man, railroad man, mechanic, workingman; you school boy, and school girl, listen to the Liberty Bell, subscribe to the Liberty Loan.

BIG BUSINESS AND LIBERTY LOANS

How Some of the Large Metal Industries Handle Liberty Loans.

THE METAL INDUSTRY addressed a letter of inquiry to a number of the large metal and manufacturing companies as to how they handled previous loans and what they had planned for the present one. The replies to this letter were as follows:

SCOVILL MANUFACTURING COMPANY, WATERBURY, CONN.

TO THE EDITOR OF THE METAL INDUSTRY:

Enclosed you will find an application blank which describes the three plans under which we sold the Second U. S. Liberty Bonds and which we found very satisfactory.

We conducted our campaigns through the foremen and their assistants. We offered no special inducements whatsoever, but simply depended upon wide publicity and the patriotism of our employees. We were very careful to see that no undue pressure was brought to bear on the sale of these bonds by an overenthusiastic foreman and also to insure our employees that everything would be done to assist them in the purchase of these bonds. If through sickness or other cause, an employee was pressed for money, the payments were discontinued until such time as he could recover. The payments were deducted in cases where the bond was subscribed for on a monthly payment plan, from the pay envelope, and on the whole this worked out very satisfactorily to both the company and its employees. It happened occasionally that the deduction during some particular week would financially embarrass an employee, and as those cases came to the attention of the pay roll clerk or the foreman, an adjustment was made to offset this condition.

The idea of the whole campaign was to instil a feeling of confidence in our employees, to work with them and to build up a patriotic feeling in the plant. Our sale of first bonds was approximately $350,000 and on our second sale about $465,000. Our foreign employees bought fully as well as our American born employees, although this may seem surprising. The fact of the matter is that we find that our Italian, Russian and Lithuanian employees are perfectly familiar with Government bonds and do not question their value as an investment proposition at any time.

D. H. PAGE,
Scovill Manufacturing Company,
Industrial Service Department.

THE SCOVILL PLAN

I hereby subscribe for United States 10-25 year 4 per cent Convertible Gold Bonds, Second Liberty Loan, as noted below, for which I agree to pay at par according to one or the other of the following plans:

PLAN NO. 1—CASH

Bonds to the amount of the subscription may be paid for in full in cash at par and accrued interest, on any date prior to January 15, 1918.

PLAN NO. 2—20 PER CENT MONTHLY

Bonds to the amount of the subscription may be paid for in five (5) monthly installments of 20 per cent each. Those amounts will be deducted from the pay envelopes each month, beginning November 15, and continuing monthly until payments are made in full. Non-negotiable installment receipts will be issued for the partial payments, and the bond will be delivered upon payments being made in full.

PLAN NO. 3—WEEKLY

Bonds to the amount of the subscription may be paid for at the rate of two (2) dollars per week or faster if desired for each fifty (50) dollar bond at the Citizens National Bank, who will deliver to the subscriber non-negotiable receipts for the weekly payments upon a form adopted by a committee representing the bankers of Waterbury. Under this plan only those of the fifty dollar denomination are available. The subscriber may take as many as he wishes of them. The bonds will be delivered by the trustees upon presentation of the full paid installment receipts.

I hereby further agree that in the event of my leaving the employ of the Scovill Manufacturing Company, either upon my own desire, or upon the request of the company, before final payment is made, to continue making payments to the company according to the above plan, and in the event of my being unable to do so, I authorize the company to dispose of my Bond or Bonds as it may deem best, and after paying the amount due thereon with all accumulations, the company to account to me for the balance, if any, and in the event of there being a deficiency I hold myself accountable to the company for the amount.

Name..... Check No.....

(At least one given name must be in full.)

BRIDGEPORT BRASS COMPANY, BRIDGEPORT, CONN.

BRIDGEPORT, Conn.

TO THE EDITOR OF THE METAL INDUSTRY:

We give you on the attached sheets the methods which we found to be most successful in getting subscriptions to the previous Liberty Loans from the employees of this company.

Yours truly,
GUY P. MILLER, Treasurer.

In the second Liberty Loan campaign we secured—notwithstanding predictions to the contrary—66% more subscriptions than in the first campaign, a total of $123,650 from 1,497 different employees.

We have two plants, each employing about 1,400. Our offices employ about 300. For our campaigns we organize as follows:

Main Plant.—Three captains, covering departments approximating 500 employees.

Union Branch.—Three captains, covering departments approximating 500 employees.

Offices.—One captain, approximately 300 employees.

For purposes of organization these captains meet for luncheon, where details are arranged and enthusiasm instilled. These captains appoint a solicitor in each department of the two plants. To promote the competitive spirit, reports of subscriptions by departments are posted while campaign is on. The departments are listed under their various captains so that the captains and departments get the spirit of rivalry.

The advertising consists of the usual posters, addresses when and where needed (these always bring definite results), and the distribution to each employee of circulars as attached.

The campaign should be carefully planned, and if details are

worked out properly the actual canvass should not require more than two or three days.

A circular we issue makes clear inducements and terms.

We would follow the same methods for the next drive as those previously used. They work.

WINCHESTER REPEATING ARMS COMPANY, NEW HAVEN, CONN.

TO THE EDITOR OF THE METAL INDUSTRY:

Enclosed herewith you will find a brief outline of the procedure employed throughout the factory in connection with Liberty Loan sales and campaigns.

Winchester Repeating Arms Company,
T. QUINPERLEY, Personnel Dept.

LIBERTY LOAN CAMPAIGN AT W. R. A. COMPANY.

The Liberty Loan Salesmen Committee of New Haven meets preliminary with representatives of this company in order to discuss the method of procedure throughout this plant. At that time groups of the best salesmen in the community are chosen and they are divided into five groups with six men to a group. The leader is an exceptional speaker. These men are instructed in the methods and the detail of the plan adopted by the company. The work of receiving these salesmen, scheduling through-

out the plant, and in fact all work, except the actual accounting, is done by the Personnel Department.

ADVERTISING.

We resort to clock notices, all the available posters we can obtain, Liberty Loan speakers, musical features with our own band, and the use of a large clock in a conspicuous part of the plant showing the progress of the Loan from day to day. One week is given to advertising prior to the week of the campaign.

CAMPAIGN.

The group of salesmen is divided according to departments and competition is thereby established, not only among the departments themselves, but with the salesmen. The group is conducted to each shop in turn in the department, the power is turned off, and a short ten-minute speech is given. The personal solicitation by these outside salesmen is then reached by each one dealing with an individual. Missionaries, men who are most familiar with the department and whose work is to make the salesmen's work easier, immediately get into touch with all individuals in the shop in order that no one is slighted. Everyone in every shop is solicited. The missionaries' work is a powerful factor in connection with the salesmen's soliciting.

It is endeavored to maintain the same personnel of salesmen throughout the entire week of the campaign. There is also a group, called the follow-up group, which makes a second cleaning after the salesmen have been through a department, and an emergency group stationed at headquarters for the request of different shops for individual salesmen to take individual subscriptions.

ACCOUNTING.

Employees are privileged to pay cash or have deductions made from their pay, which will continue over the shortest period of time in which the employee can be persuaded to pay for his bond. The moneys deducted are transmitted to the various banks with which the employees prefer to deal, and they hold the bond in custody until the whole amount is paid.

CHASE COMPANIES, WATERBURY, CONN.

TO THE EDITOR OF THE METAL INDUSTRY:

It is our experience that personal solicitation is the most successful way of getting subscriptions. Naturally, we did all the advertising possible by way of posters and speakers in our restaurants at the lunch hour.

The method followed very largely was what is known as the Waterbury plan. The subscriber to the loan promises to pay at whatever bank he selects $2 per week until the bond is paid for. No plans have yet been formulated for the Third Loan.

Chase Companies, Inc.,
W. G. GREEN.

THE AMERICAN BRASS COMPANY, WATERBURY, CONN.

TO THE EDITOR OF THE METAL INDUSTRY:

We adopted no particular measures to secure subscriptions to the previous Liberty Loans. The matter was handled by various local organizations. JOHN A. COE, JR., Vice-President.

GORHAM MANUFACTURING COMPANY, PROVIDENCE, R. I.

TO THE EDITOR OF THE METAL INDUSTRY:

We have made no *special* effort to sell the Liberty Bonds to our employees. We gave them every opportunity to subscribe but made no attempt to even seem to force the issue upon them. We had competent speakers from the city who came to our Casino, a meeting place, to speak to our employees at noon and explain the details to them.

We allowed the employees who desired to do so, to purchase the bonds, paying us back at the rate of a dollar a week on a $50 bond. We made no charge for interest, giving the employee in every instance the coupons.

We have made no special plans at this writing for the new issue although we shall, as always, give our people every opportunity to "go the limit," as they always do.

Gorham Manufacturing Company,
WM. S. STONE, Secretary.

AMERICAN HARDWARE CORPORATION, NEW BRITAIN, CONN.

TO THE EDITOR OF THE METAL INDUSTRY:

Our only method was that of personal solicitation coupled with the opportunity to make payments in ten monthly or fifty weekly installments. The results of this were so satisfactory that we expect to pursue the same plan in the future.

H. C. M. THOMSON, President.

HOYT METAL COMPANY, ST. LOUIS, MO.

TO THE EDITOR OF THE METAL INDUSTRY:

On the First Liberty Loan we gave our men privilege to subscribe to the bonds, deducting from their pay $4 per month on each $50 bond subscribed. Our experience has not been very satisfactory inasmuch as about 60 per cent. of our employees are a floating class and when leaving our employment we have, of course, refunded the payments which they have made, and as a result but a comparatively few of the subscriptions made have been actually completed, and bonds, of course, have been thrown back on our hands.

On the Second Loan we merely subscribed for such bonds as our men requested, and these have been paid for more promptly.

B. J. THOMPSON, Vice-President.

THE NEW JERSEY ZINC COMPANY, PALMERTON, PA.

TO THE EDITOR OF THE METAL INDUSTRY:

Our company did not handle the raising of subscriptions to the Liberty Loans. It was handled exclusively by private individuals.

The method employed was the districting of the town and placing in each district a team of ten men, who made a thorough canvass of the district which was allotted to them. We know that this method was quite successful, and we understand that the leaders have decided to use the same method for handling the Third Liberty Loan. W. M. KELSEY, Superintendent.

ELEMENTS OF ELECTRO-CHEMISTRY

SOME INSTRUCTION FOR THE PLATER WHO WISHES TO UNDERSTAND THE THEORY OF WHAT HE DAILY PRACTICES

WRITTEN FOR THE METAL INDUSTRY BY JOSEPH HAAS, JR.*—FIRST PAPER.

INTRODUCTION

This work is undertaken with the view of enumerating laws and principles of electro-chemistry and just how they can be applied to practical electro-plating. There seems to be a great discrepancy as to the action of the electric current in plating solutions among platers; so to correct some false notions the phenomena that take place when the electric current is passed through solutions will be strongly emphasized. All chemical changes are brought about by some force, and the force that the plater is interested in is electricity. But those changes that electricity brings about are chemical, so the term electro-chemical is applied.

I. GENERAL CHEMICAL PRINCIPLES

1. ELEMENTS

There exist today ninety-one substances that the chemist has not been able to convert to simpler substances. These substances have been called elements. An element, therefore, is a substance which has not yet been resolved or broken up into any simpler form of matter.

2. COMPOUNDS

The term itself suggests a definition. A compound is a substance formed by the combination of two or more elements, or it is a substance which can be broken up into simpler substances.

Example—Sulphate of copper, composed of elements copper, sulphur and oxygen.

3. ATOMIC THEORY; ATOMS; AND ATOMIC WEIGHTS

The atomic theory is an assumption of the ultimate constitution of all substances that we find everywhere about us. The statements of the theory are as follows:

(a) Matter is made up of small particles called atoms.

(b) Atoms possess the power of holding on to other atoms.

(c) Atoms do not subdivide in taking part in a chemical change.

(d) One atom of one element is exactly like every other atom of that element as regards weight, structure, size, color; but differs from an atom of any other element as regards the same things.

An atom, it can be seen from the above statements, is the smallest part into which an element may be divided. It is also the smallest part of an element that takes part in a chemical change. All matter has weight. So the chemist in his researches and works upon elements has come upon a substance that weighs the lightest of all others. This element is hydrogen—a gas. By calling the weight of an atom of this gas one and comparing the weights of the other elements with it, the chemist has arrived at a system of relative weights of all the elements. The atomic weight of an element is the weight of an atom of the element compound with hydrogen taken as one.

4. MOLECULES

A molecule is the smallest amount of an element or compound which can be conceived of as existing alone and still retain the characteristic properties of the whole substance.

5. ACIDS

An acid is a compound containing hydrogen which can be replaced by a metal. All acids, when they have metals placed in them, have the hydrogen replaced by the metal, and the hydrogen may and may not be given off as a gas. It is due to this hydrogen that acids redden litmus paper.

6. BASES

A base is a compound that neutralizes or destroys acids. All bases contain a group of atoms known as hydroxyl (OH), which is combined with a metal. The property of bases to turn red litmus blue is ascribed to the hydroxyl group.

7. SALTS

A salt is the result of a combination of an acid with a base, or a combination of an acid with a metal.

8. SYMBOLS

So that the chemist would not be compelled to always write out the names of the elements he has adopted a short-hand method of writing them which is suggestive of the name. (See table of atomic weights.)

9. FORMULA

A formula is a short-hand method of writing the names of compounds. It essentially stands for one molecule of the compound. It is formed by writing the symbols of the elements that are composed expressing by subscripts how many times each element is taken.

By taking a specific case the matter can be more clearly illustrated. The formula for sulphate of copper is $CuSO_4$. Thus this formula tells the chemist:

(1) That the molecule of sulphate of copper consists of one atom copper, one atom sulphur, 4 atoms of oxygen.

(2) That the one molecule is composed of 63 parts by weight of copper, 32 parts by weight of sulphur, 64 parts by weight of oxygen.

(3) The formula also tells the weight of a molecule or the molecular weight of the sulphate of copper. This is arrived at by adding together the atomic weights multiplied by the number of times the element appears in the formula.

Molecular weight, $CuSO_4$ =					
Atomic weight,	Cu (63.57)	multiplied by	1	=	63.57
" "	S (32)	"	1	=	32.
" "	O (16)	"	4	=	64.
					159.57

10. CHEMICAL EQUATION

The chemical equation is a short-hand method of showing exactly what quantities of elements or compounds take place in a reaction and what products are formed. The atomic theory explains the manner in which elements unite to form compounds. The amount of each element required to make a compound is also best explained by the atomic theory. Compounds are formed by the union of atoms of different elements and the proportion by weight in which they combine is always constant. The atomic weights form the basis of all chemical reactions. They are the means by which chemical reactions are expressed quantitatively.

Example:

$$H_2 + Cl_2 = 2\,HCl$$
$$2 + 71 = 73$$

The atomic weights of the elements entering into a reaction are taken as many times as they appear in the reaction. In the example, hydrogen appears twice and chlorine twice, so the atomic weights of each are multiplied by two. It should be noticed that the sum of the weights on the left is equal to the weight of the hydrogen chloride formed.

*Mr. Haas is now a sergeant in the Overseas Surgical Instrument Repair Unit with the American Expeditionary Forces in France.

The numbers under the reacting elements in the example may be taken as grams, ounces or pounds. So if we wished to form 73 pounds of HCl we would have to take 2 pounds H_2 and 71 pounds Cl_2. As a further illustration let us take an example that all platers are familiar with—the formation of carbonate of copper from sulphate of copper. Suppose we wished to know how much carbonate of copper could be formed from 10 pounds sulphate of copper. The first step is to write out the chemical equation; the second is to find the molecular weights of substances involved; the third to make an arithmetical proportion and solve.

INTERNATIONAL ATOMIC WEIGHTS (1914)

O = 16

Aluminum	Al	27.1	Molybdenum	Mo	96.0
Antimony	Sb	120.2	Neodymium	Nd	144.3
Argon	A	39.88	Neon	Ne	20.2
Arsenic	As	74.96	Nickel	Ni	58.68
Barium	Ba	137.37	Niton (radium emanation)	Nt	222.4
Beryllium	Be	9.1	Nitrogen	N	14.01
Bismuth	Bi	208.0	Osmium	Os	190.9
Boron	B	11.0	Oxygen	O	16.00
Bromine	Br	79.92	Palladium	Pd	106.7
Cadmium	Cd	112.40	Phosphorus	P	31.04
Cæsium	Cs	132.81	Platinum	Pt	195.2
Calcium	Ca	40.07	Potassium	K	39.10
Carbon	C	12.00	Praseodymium	Pr	140.6
Cerium	Ce	140.25	Radium	Ra	226.4
Chlorine	Cl	35.46	Rhodium	Rh	102.9
Chromium	Cr	52.0	Rubidium	Rb	85.45
Cobalt	Co	58.97	Ruthenium	Ru	101.7
Columbium	Cb	93.5	Samarium	Sa	150.4
Copper	Cu	63.57	Scandium	Sc	44.1
Dysprosium	Dy	162.5	Selenium	Se	79.2
Erbium	Er	167.7	Silicon	Si	28.3
Europium	Eu	152.0	Silver	Ag	107.88
Fluorine	F	19.0	Sodium	Na	23.00
Gadolinium	Gd	157.3	Strontium	Sr	87.63
Gallium	Ga	69.9	Sulphur	S	32.07
Germanium	Ge	72.5	Tantalum	Ta	181.5
Gold	Au	197.2	Tellurium	Te	127.5
Helium	He	3.99	Terbium	Tb	159.2
Holmium	Ho	163.5	Thallium	Tl	204.0
Hydrogen	H	1.008	Thorium	Th	232.4
Indium	In	114.8	Thulium	Tm	168.5
Iodine	I	126.92	Tin	Sn	119.0
Iridium	Ir	193.1	Titanium	Ti	48.1
Iron	Fe	55.84	Tungsten	W	184.0
Krypton	Kr	82.92	Uranium	U	238.5
Lanthanum	La	139.0	Vanadium	V	51.0
Lead	Pb	207.10	Xenon	Xe	130.2
Lithium	Li	6.94	Yetterbium (Neoytterbium)	Yb	172.0
Lutecium	Lu	174.0	Yttrium	Yt	89.0
Magnesium	Mg	24.32	Zinc	Zn	65.37
Manganese	Mn	54.93	Zirconium	Zr	90.6
Mercury	Hg	200.6			

(1) $CuSO_4 + Na_2CO_3 = CuCO_3 + Na_2SO_4$.

(2) As all we are concerned with is $CuSO_4$ and $CuCO_3$, we only have to know the molecular weights of these two substances.

$$CuCO_3 = 63 + 12 + 48 = 123$$
$$CuSO_4 = 63 + 32 + 64 = 159$$

(3) $CuSO_4 : CuCO_3 = CuSO_4 : CuCO_3$

$159 : 123 = 10 : x$

$159x = 1230$

$x = \frac{1230}{159} = 7.1$ pounds $CuCO_3$ formed from 10 pounds $CuSO_4$

The problem may have been looked at from the point of view of finding how many pounds Na_2CO_3 would be necessary to convert 10 pounds $CuSO_4$ to $CuCO_3$. Here the factors would be $CuSO_4$ and Na_2CO_3 and we would have to know the molecular weights of these two substances.

$$CuSO_4 = 63 + 32 + 64 = 159$$
$$Na_2CO_3 = 46 + 12 + 48 = 106$$

Then—

$CuSO_4 : Na_2CO_3 = CuSO_4 : Na_2CO_3$

$159 : 106 = 10 : x$

$159x = 1060$

$x = \frac{1060}{159} = 6.5$ pounds Na_2CO_3 to convert 10 pounds $CuSO_4$ to $CuCO_3$.

VALENCY

The valency of an element or a group of elements is the number of hydrogen atoms it will combine with or replace. Valency of hydrogen is taken as one (1).

Example.—In hydrochloric acid, HCl, the valency of chlorine is one (1), because it combines with one (1) H atom. In sulphuric acid the valency of the sulphate radical (SO_4) is two (2) because it combines with two (2) hydrogens.

Thus by remembering these two examples the valency of any atom or group of atoms can be arrived at.

$AgCl$; — $Ag = 1$ $\quad Al_2$; — $Al = 3$

$CuSO_4$; — $Cu = 2$ $\quad CuCl_2$ — $Cu = 2$

(To be continued.)

POLISHING ETCHED STEEL PLATES.

A corrspondent writes as follows: "I would very much appreciate any information you may give me as to the methods and materials employed in polishing etched steel printing plates, where the letters are etched into the plates to hold the ink and the ground is to be absolutely free from even the finest scratch."

ANSWER.

The production of a very high polish, free from the most minute scratches upon steel requires a thorough and practical knowledge of steel polishing. Where the steel is to be etched all polishing must precede the etching.

The following manipulations will give you some idea of the method to follow: First, rough out on leather covered wooden wheels coated with 100 emery, which is applied to the leather by first coating with an adhesive glue used warm and afterwards rolling in the emery to coat the wheel uniformly. Allow the emery to dry on in a warm place for at least 12 hours, and then fine down with a flint stone or pumice while the wheel is revolving. A little tripoli may be used upon the wheel.

Second—Another wheel should be set up in the same manner as the wheel mentioned above, but use 160 to 180 emery and fine down as mentioned. Apply a little beeswax by pressing a cake of wax against the wheel while revolving. A little tripoli or fine emery paste made up with 180 emery may be used.

Third—Polish with a bristle brush, using emery paste of 200 fine or flour emery. The emery pastes may be purchased from dealers in polishing supplies.

Fourth—Wash the surface of the steel in benzine and finally polish with cloth or sheepskin buffs, using Vienna lime composition or a very fine grade of red rouge. In polishing the plates do not polish in the same direction, but change the angle, for in this manner it is possible to eliminate all the fine lines and produce a mirror surface.—C. H. P.

DESIGN VALUE OF DECORATIVE MOTIFS

A Series of Articles on This Interesting Subject Has Been Prepared by the Author with the Object in View of Giving the Student Craftsman in Art Metal Work a Comprehensive Idea of the Design Value of Decorative Motifs, Their Characteristics Peculiar to the Particular Period or Style in Which They Appear and So Far as Possible to Explain Their Origin, Symbolic Significance and Decorative Value. It Is the Author's Sincere Hope That the Series Will Fulfill the Purpose for Which It Has Been Prepared—Fourth Paper.

Written for the Metal Industry by A. F. Saunders, Designer Benedict Manufacturing Company, East Syracuse, N. Y.

Proper decoration depends upon two essentials—suitability to location and unity. The value of these two factors is equal, as it applies to the selection and application of ornament in the designing of art metal wares equally as well as in architecture, furniture, pottery, or in fact any object in elements of decorative art enters into its conception, composition and execution. One may ask, What constitutes proper decoration? My dictionary says that "to decorate is to embellish, to adorn with something becoming or ornamental." We can draw little from this definition, it is too broad and fails to limit the quality or adaptability of an ornamentation.

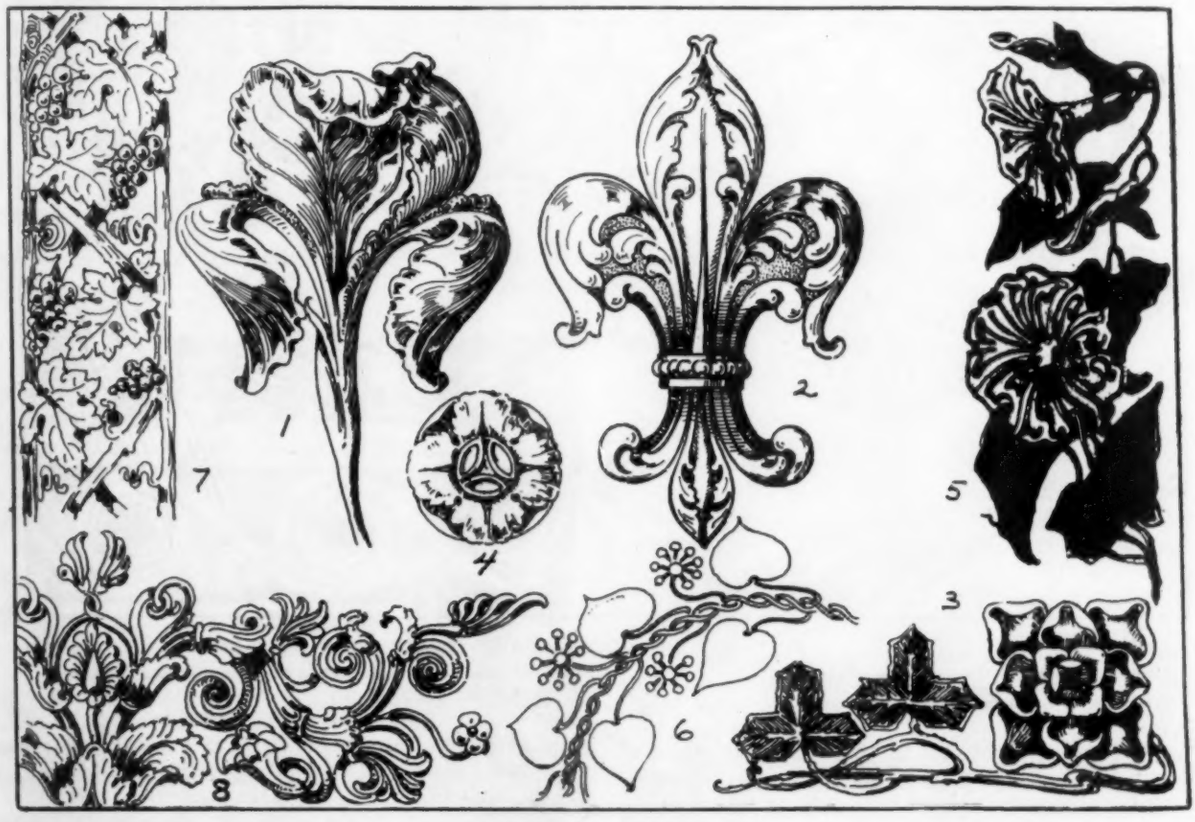


PLATE 7, PLANT MOTIFS.

1. Natural Iris Flower.
2. Conventional Iris, Fleur-de-Lis, French Renaissance.
3. Conventional Rose Motif, Modern.
4. Rosette, Conventional Poppy Flower, French Renaissance.
5. Convolvulus or Morning Glory Motif, Suggestive of Scroll Forms.
6. Vine Motif, Ivy, from Decorative Border on a Greek "Hydra" (Water Jar)
7. Grape Vine Motif Used as Border, Modern.
8. Greek Scroll Forms, Acanthus.

To begin with, there is a distinction between ornament and decoration. The term decoration signifies the art or process of applying the various elements of ornaments to beautify an object. It also denotes the complete result, thus the designer, in working out the decoration of —we will say, a silver vase, may represent ornament upon it. The ornament becomes the decoration, but that such ornament may be the proper decoration for the particular object in hand, depends entirely upon the skill of the artist. This brings us to the point.

Decoration means a certain something in the order of the universe which is neither the ornament or the thing, but a harmonious blending of both. It also means the adorning of existing utilities with a pattern or motif which adds aesthetically something which pleases and satisfies the eye, the intellect and the affections; yet in no way interferes with the utility of the object itself.

We apply decoration to countless objects, and the style may be varied without being arbitrary; the kind and style of decorative ornament being determined by the aim and the material of the object to be decorated.

Ornaments are divided into arrangements or divisions according to their functions and the reciprocal relation

between the construction of the object and the application of the ornament as a decoration, roughly speaking these divisions consist of borders or bands, as shown in Figures 7, 10 and 11, Plate 7 and 8. Repeats, Figure 9, Plate 8, enclosed ornaments such as panels, free or disconnected ornaments, and supports such as feet, bases, pillars, etc., expressing the principle of weight-bearing.

Decoration is divided into elements such as geometrical patterns, plant motifs, animal or bird motifs, the human figure, artificial objects such as symbols, also the phenomena of nature as snow crystals, the clouds and waves; but as pointed out in a former article of this series, plant life offers the greatest field of all as a source of inspiration shows this symbolic ornament as a decorative motif in the style of the French Renaissance.

The rose has, for centuries, borne the title of Queen of Flowers. It has figured in the art, the mythology and history of centuries past.

There is an ancient Hindoo myth that tells us that "the Lord of the world, the God of life, one of the trinity of bright Aryan Gods, discovered his wife, Pagoda Siri, in the heart of a rose."

Another fable tells us that Flora, having found one of her favorites dead, asked the assistance of the Olympian deities to change her into a flower which all others would acknowledge to be queen. "Apollo lent the vivifying

PLATE 8, PLANT MOTIFS SCROLL FORMS.

9. Repeating Ornament, Persian Floral Motif.
10. Border or Band Ornament, Persian.
11. Egyptian Lotus Border Ornament.
12. Scroll Ornament, Floral and Symbolic Motifs, Louis XVI Style.
13. Festoon, Floral Motifs.
14. Festoon, Plant Motif, Laurel, Modern.

tion. There are indeed few of the decorative styles of ornament, but what in composition depend largely upon plant motifs, conventionalized into various forms of ornament. The greatest variety of flowers have been used, and perhaps one of the best known is the common Iris, well named after the mythical Rainbow Goddess, since its colors are many. There has been much discussion as to whether or not that well known heraldic device and decorative motif called the Fleur de Lis, Figure 2, Plate 7, is really a conventionalized Iris flower or merely a form of Halberd. It certainly requires but little imagination to see the great similarity between this conventional ornament and the flower in question when the two are placed side by side, as shown in Figures 1 and 2, Plate 7. Whatever the origin may be, many a good soldier has fought valiantly to preserve unsullied the white banner with the gilded trefoils that floated over his head and has died to save the "Lilies of France," this same device, "Fleur de Lis," emblazoned upon its folds. The illustra-

power of his beams, Bacchus bathed it in nectar, Vertumnus gave it perfume, Flora herself gave its diadem of flowers, and the rose was the result."

The rose became celebrated in English history, it having been adopted in the fifteenth century as the badge of the rival houses of York and Lancaster. The white being chosen by the former, the red by the latter, and what torrents of blood were shed in the civil wars called the "Wars of the Roses." Little wonder then that this symbolic flower should figure so often as a decorative motif in the styles of past centuries. Its decorative qualities and symbolic associations place it among the leading forms of plant motifs worthy of the study of the designer.

Although the vine does not occur frequently, it is not an unpopular element of artistic decoration. The antique and medieval styles in particular show a preference for the vine, and the most commonly used are the grape and ivy. In the antique the vine is the attribute of Bacchus, hence its use as a suitable decorative motif in adorning

all kinds of drinking vessels. The ivy, symbol of friendship, is often found as a decorative motif on ancient vases.

The easy flowing and curved lines of the vine have, without a doubt, suggested and inspired various forms of scroll ornament, although the commonly called Acanthus scroll of Greek origin (Figure 8, Plate 7) probably grew out of a natural desire to clothe with some sort of leafage, the spiral lines with which archaic ornament, whether in Greece or the Fejee Islands, invariably set out. Such spiral lines were probably suggested by the markings found on many shells and the horns of some animals.

The Greek scrolls, as in Figure 8, Plate 7, consist practically of nothing more than brushing spirals, with just a husk of something like foliage, which serves to mark the dividing of the stem. The flowers are really minor features, to fill up and form no integral part of the main purpose. With the Roman form of scroll the whole effect is more massive, as it is based upon a succession of overlaying leafage, resulting in a heavy overdone appearance. The scroll form of ornament reached its highest state of development in the Renaissance; here we find a far more delicate rendering of both line and foliage. Figure 12, Plate 8, shows scroll treatments as found in the style of Louis XVI. One may note that this French rendering is not the usual rounded form of scroll based on the circle as is the case in the Italian Renaissance, but a flattened scroll having the effect of an ellipse. This is a subtle method of suggesting the same delicate lightness that seemed to be the main desire of the decorative designers of that period.

A circle suggests strength or resistance, an ellipse seems about to flatten out, and the idea of something caught while in movement is evidently what the French artists desired to suggest.

Another popular motif is the festoon (Figures 13 and 14, Plate 8). Festoons of fruits and flowers are common in the Roman and Pompeian styles, in the various periods of the Renaissance, and in the semi-classical styles of the eighteenth century. The idea of the festoon was derived from the ancient custom of using actual clusters of fruit and flowers for the festival decoration of temples and public places, which idea in turn might perhaps be traced to a suggestion from the many trailing plants found in nature. The festoon motif was used with fine discrimination and restraint by the Greek, Roman and Pompeian artists, developed and enlarged during the Renaissance, and was decidedly overdone by the French revivalists of the seventeenth and eighteenth centuries.

The next article of the series will take up other natural forms which are capable of reproduction in metallic articles of utility.

GOVERNMENT STANDARDS FOR ELECTRO-PLATING

A Report of a Conference on Electro-Plating of Military Materials Held at the Bureau of Standards, Washington, D. C.

In opening the conference on electro-plating materials at the Bureau of Standards, Wednesday, March 27, 1918, at 10 A. M., in the presence of a delegation of the military authorities and the representative members of the plating industry, together with the officials of the American Electro-Platers' Society, W. E. Stratton, Director of the Bureau, struck the keynote for the success of this country in the World's War when he mentioned that co-operation was absolutely essential in all lines of industry to enable the Government of the United States to bring to a successful termination its part in the victory of democracy against military autocracy. Dr. Stratton welcomed the military and electro-plating representatives in a few chosen words and explained to them the work of the Bureau of Standards in co-operating with every industry to standardize the methods of production so that the greatest efficiency could be maintained in the industrial plants of this country. Dr. Stratton wished the men attending the conference every success in their deliberations and regretted that he was unable to be present. He was heartily cheered by all present.

Dr. W. Blum, also of the Bureau of Standards, and chairman of the International Aircraft Standards Board, then outlined the work of the conference, which was as follows:

PROGRAM.

1. What kinds of plating should be used for certain classes of materials, and to what extent are specifications required?

A. For materials not subject to severe corrosion conditions.

Copper, nickel, brass and silver plating, and black finishes. Specifications required for which?

B. For outdoor and marine exposure.

Zinc coatings. Specifications required for which?

2. What should be the basis of plating specifications?

A. Conditions of plating.

(1) Sand blasting vs. pickling.

What is the effect of pickling and plating on physical properties of the steels employed?

(2) Is it desirable to specify the composition of solutions or the conditions of operation?

B. What is the best means of defining the quantity of the coatings?

(1) As average thickness, or (2) as weight per unit area (or piece).

C. What maximum thickness of coating should be permitted on dimensioned parts, especially threaded parts? What is the effect of a large tolerance on the strength of threaded parts?

D. What accelerated corrosion test should be used? Should the salt spray test be recommended for copper or nickel plating, etc.? If used for zinc coatings, is 3 days' exposure to salt spray satisfactory for general materials, and 5 days for marine articles?

3. Methods of testing. Define essential points in methods of testing, e. g.

(a) Thickness measurement by metallographic examination.

(b) Antimony chloride (and lead acetate?) stripping tests.

(c) Salt spray test.

4. What is the best means of providing adequate plating inspection? Is it desirable and feasible for a number of traveling plating inspectors to be engaged to represent, (1) individual branches of the Government, or (2) several branches jointly? In the latter case, by whom and under what supervision should they be en-

gaged, and how can they be best selected? Suggested duties of such inspectors might be:

(a) To examine the operation of plating plants engaged on military supplies.

(b) To recommend to the operators and to local inspectors, desirable changes or improvements.

(c) To report any continuation of faulty or defective processes.

(d) To select specimens for laboratory examination.

(e) To advise upon points requiring investigation.

Charles H. Proctor, founder of the American Electro-Platers' Society, then responded to Dr. Stratton and Dr. Blum and assured the military authorities that through the Bureau of Standards the members of the society would give their fullest co-operation to assist in every way possible to bring victory to American arms.

The subject of the most efficient methods of preventing corrosion of iron and steel parts used by the military department of the Government were then discussed in detail, and it was the consensus of opinion that deposits of zinc gave the most effective coating to prevent such corrosion. This decision was carried by a majority vote.

George B. Hogaboom, vice-president of the American Electro-Platers' Society, responded in the affirmative at some length, and explained that it was the earnest desire of the society to give the greatest measure of support. Mr. Hogaboom was followed by Walter Fraine, president of the above society, who, in well chosen words, emphasized what had already been said. T. C. Eichstaedt, William Schneider and Mr. Harris, the latter chemist for the Western Electric Company, also spoke at some length, while representatives of the military authorities also favored the conference with their views. These speakers were followed by members of the bureau-staff, who outlined the methods of testing materials, especially in regard to tests made with copper, nickel and zinc-plated steel and iron parts, and which tests proved that zinc was the most efficient metal for a protective coating against corrosion. Samples of commercial products furnished by the Government and which had been tested were passed around by Dr. Blum.

The copper-plated steel articles were covered with rust, the copper and nickel-plated steel did not stand up much better, while the zinc-plated steel was practically unacted upon after exposure to the salt spray test, which consisted of a twenty-five per cent. solution of sodium chloride sprayed upon the surface at a pressure of six pounds in the form of a fine mist. This material was sprayed on the zinc-coated steel for a period of ten days.

The next subject discussed was the question of whether or not specifications were required for materials not subject to severe corrosion conditions. It seemed to be the sense of the meeting that no particular specifications were required for copper, nickel, brass and silver plating, but that black finishes should be specified as black nickel and that the copper oxide or more correctly speaking the copper sulphide finishes should not be used.

Other members of the plating trade who took active part in the discussions were Oscar E. Servis, secretary of the American Electro-Platers' Society, Fred Liscomb and F. J. Taylor, of the Munning-Loeb Company, Matawan, N. J.

The next subject taken up for discussion was the most efficient method for testing zinc-plated products, and the Preece test was discussed in detail, also the sodium hydroxide test and the antimony chloride test. All present had an opportunity to speak upon the subject of tests, and it was finally decided by a majority vote that the sodium chloride spray test should be adopted until the bureau discovered a more suitable test. The current unit test was thought to be the most advantageous method for determining the thickness of zinc to be deposited to withstand the test. The unevenness of surfaces was considered, and also the minimum amount of zinc that could be deposited where there were two separate units, such as nuts and bolts; for in such an instance the threads must be considered, otherwise extra labor would be involved in retapping to reduce the amount of zinc deposited. For such surfaces it was suggested that the minimum amount of zinc should be deposited that would withstand the corrosive test.

No arbitary methods of plating or testing were laid down, as this matter was left entirely to the manufacturing concerns doing Government work, for it was understood that the platers would be only too willing to adopt the most efficient methods. It was also deemed inadvisable to recommend any special type of formula for the acid or alkaline cyanide zinc solutions, and this matter, too, was left entirely to the plating departments of the various concerns.

As a basis for the thickness of zinc to withstand the corrosive tests, the weight deposited should approximate fifty millograms per square inch of surface which would approximate one-fourth ounce (avoirdupois) per square foot of surface.

Discussion as to the cause and effect of crystallization of high carbon steels which caused brittleness and breakage was introduced by one of the military representatives. This discussion was taken up by many platers, and the opinion was that the occlusion of hydrogen from pickling and plating solutions containing free acids was no doubt the cause of the crystallization of the steel. It was then suggested that acid solution should be avoided in cleaning high carbon steel, especially for cleaning such articles as springs, and that the wet method of tumbling be adopted, together with the use of such an abrasive as sand or emery with an alkaline soda solution. The carbon surface produced upon the springs by oil tempering could then be removed without danger to the steel. It is a well-known fact that strong acid pickles do not remove the carbonized black surface.

The suggestion of Charles H. Proctor that a secondary factor be used to give added protection to zinc-plated steel, especially upon aeroplane parts, by immersing the parts in a mixture of 10 parts paraffin and 90 parts of paraffin oil, at a temperature exceeding 212 degrees Fahrenheit, brought forth considerable discussion, and the suggestion was acted upon favorably. Mr. Proctor further stated that if the method was adopted it would give a greater life to the zinc-plated material, as the high temperature would expel all of the moisture from pores or pin holes in the steel, filling them with the paraffin mixture, which would prevent moisture from becoming occluded and, therefore, give an added protection to the entire plated surface. Mr. Harris, of the Western Electric Company, stated that such experiments had been made, and that although it had not been adopted, tests of articles so treated showed that the coating would last at least six months longer than without it.

The advisability of having practical platers working with the Bureau of Standards and military departments as traveling advisors was favorably adopted. It was thought that such men could be employed at an approximate cost of six thousand dollars per year, not including traveling expenses. This decision will be made later by the bureau and the military authorities.

At the close of the meeting Dr. Blum thanked all present for their hearty co-operation in the work, as outlined in the program.

METHODS FOR COST ESTIMATING

AN ARTICLE DEALING WITH COST OF METAL MANUFACTURE AND WHICH WAS SUGGESTED BY "FACTORY PRODUCTION COSTS," PUBLISHED IN THE METAL INDUSTRY, FEBRUARY, 1918.

WRITTEN FOR THE METAL INDUSTRY BY METT MCKUNE.

An actual cost is prepared from data secured from the records furnished by the factory and office as to the quantity of material used, labor cost, etc. Such a cost relieves the cost department of much of the responsibility and dissatisfaction which is often caused by the results found, for if the data from these records is properly entered, it can be traced back to its source.

In distinction from an actual cost an estimate is a guess as to the material, the labor, and sometimes also as to the overhead charges.

But every cost department is or should be prepared to make estimates; in fact, the preparation of actual costs is the best training for this work possible.

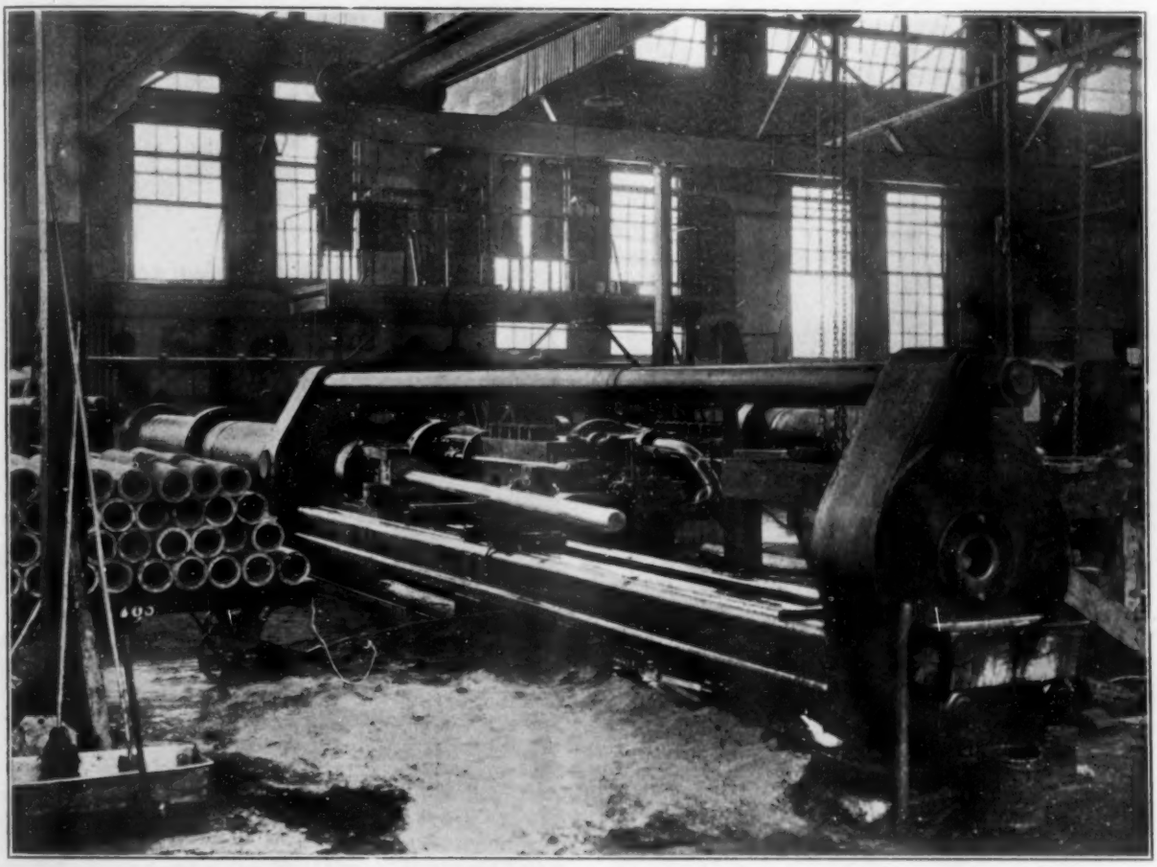
The ideal condition for the cost man would be to have a quantity of the articles made, so as to have available exact figures from which to work, but this is not possible for many reasons.

Many manufacturers find it necessary to purchase parts from other concerns and often these have to be made especially for them. If this is the case they will quite naturally require a price before placing an order, which makes it necessary for the concern manufacturing to have an estimate. Also most manufacturers catalogue and make a selling price on an article before manufacturing any large quantity. This makes it necessary in this case to estimate, but in this instance a sample is generally made so that the task of estimating is somewhat simplified.

Estimating from a sketch presents no great difficulties, and while the figures obtained may, and they are not expected to be, exactly correct, yet they can be sufficiently near to the correct cost to serve as a basis for making a selling price, which is the main end to be attained.

If a sketch of the article on which a cost is required be furnished, it is necessary for the estimator to take into consideration the shape of the finished article, the dimensions, the metal of which it is made, the finished gauge, and the gauge metal from which it is made. If the article or part be made from sheet metal from the dimensions and finished gauge we can determine the size of the blank or diameter of the blanking die and make proper allowance for width of stock required.

The formula for cylindrical shells, while it will not answer for all shells, is approximately correct and will



A HYDRAULIC COPPER AND BRASS TUBE DRAWING MACHINE DESIGNED BY FERDINAND DEMING AND BUILT BY THE HYDRAULIC MACHINERY COMPANY, LTD., MONTREAL, AND INSTALLED AT THE PLANT OF THE DOMINION COPPER PRODUCTS COMPANY, LACHINE, CANADA.

serve to illustrate the method for determining the diameter of the blank. The formula is as follows: D = $\sqrt{}$ d2 + 4dh, in which D = blank diameter, d = shell diameter, h = height of shell.

To further illustrate let us assume that we have a shell, the diameter of which is 3 inches and the height 5 inches.

The first step is to square the diameter which gives us $3 \times 3 = 9$. The second step is to multiply the sum obtained by multiplying the diameter by the height by four. $3 \times 5 \times 4 = 60$. To this is added the first figure found. $9 + 60 = 69$. Then we extract the square root of this sum.

8	69.00.00	) 8.30
2	64	———
—	—	
16	500	
10	489	
—	—	
160	1100	
3		
—		
163		
10		
—		
1630		

Which gives us a blank diameter of 8.3 inches. But it must be understood that the stock required will have to be wider than the blank. For a blank of this size it would require stock at least one quarter of an inch wider, so that the width of the stock required would be 8.3 in. + .25 in. + 8.55 in. or approximately 8½ inches.

A larger blank would require a relatively greater width of stock. A blank 10 inches in diameter would probably be cut from 10½-inch stock; while it is possible to cut from slightly narrower stock in estimating whether it be labor or material, it is always good judgment to use figures which may be greater than an actual cost would show.

We have now determined the width stock necessary to make a cylindrical shell, the dimensions of which are diameter 3 inches, the height 5 inches.

If the shell is round the area of the stock would be determined by squaring the width used. $8.5 \times 8.5 =$ 72.25 square inches. Then reducing this to square feet. $72.25 \div 144 = .50$ square feet. We next determine the gross weight by multiplying the area in square feet by the weight per square foot. Assuming that the stock used is 24-gauge brass from tables of weights, we find the weight per square foot to be .8901, which gives us .8901 $\times$ .50 = .445 lbs., the gross weight of stock required to blank a cylindrical shell from 24-gauge brass with a finished diameter of 3 inches and a height of 5 inches.

In practice the blank may be staggered so as to effect a saving in material, but in estimating it is not good judgment to take this into consideration unless a very close figure is required and then only when the estimator is sure this will be done. He must always bear in mind that he is responsible for the accuracy of the results found and an error on his part may mean a serious loss to his employers.

If the shell has gone through several drawing or stamping operations it will be readily seen that it has quite probably been thinned some by these operations, consequently corrections must be made for the stretching of the metal. There can hardly be a fixed rule for this, as the material used must be taken into consideration as well as the diameter of the blank. Some metals will stretch more than others and the size of the blank may affect it to a degree also. The gauge of stock used is also a factor to be considered. The estimator must use his knowledge of metals in determining the extent the metal has thinned in finding the thickness of metal required to produce a shell of a given thickness.

The ratio of the finished gauge to the blank diameter will give fairly accurate figures. That is, assuming that a shell has a finished thickness of 26-gauge, requiring a blank 8.5 inches and is to be cut from 24-gauge brass, we would have as our figures 26 : 8.5 :: 24 : x = 7.8 inches.

The determination of the net weight of the shell if it has only been blanked and drawn or stamped and trimmed and has not been punched or perforated will be approximately 65 per cent of the gross weight if it has been punched or perforated, while the actual loss may be determined. Figures nearly correct can be estimated in most cases.

Cutting the head off a cylindrical shell and making it into a tube will greatly reduce the weight, for the head is very slightly, if at all, affected by the drawing or stamping operations and will probably be found to be the same thickness as the original stock used, so that a drawn tube will show a net weight of about 40 per cent of the gross.

The illustration used was that of a brass shell, but the main point is to determine the area of the blank and from tables the weights per square foot may be found whether the metal be brass, iron or steel.

If the article is made from material bought by the square inch or square foot it is, of course, not necessary to determine the gross weight. The width of the stock required and the dimensions of the stock only are taken into consideration.

If we were to cut a shell requiring stock 4 inches wide from sheet tin 14 $\times$ 20 in. we could cut 3 in. from the 14 in. width and 4 in. from the 20 in. width and allow sufficient for scrap, as before stated, by staggering more than this could be cut.

In determining the gross weight of brass tubing or rod, the net length and size being known, we proceed as follows:

Tubing or rod stock is bought in random lengths of from 14 to 16 feet. We must take into consideration the net length, the loss in sawing or cutting off and the scrap end, which may be worked up, but usually finds its way into the scrap. As our formula we have

$$G = N + S + E$$

G = gross length, N = net length, S = loss in cutting off, E = scrap end. Assuming that we have a brass nipple made from ¼-in. round brass rod, the net length of which is 1 in., and having found that the scrap end is 4 in., we have as follows:

1 in. + 3/32 in. + .02% = 1.12 in. gross length.

1.12 in. ÷ 12 = .093 ft. gross length.

The weight of ¼-in. round brass rod per linear foot being .1811, we have

.093 ft. $\times$ .1811 = .017 lbs. gross weight

in which 1 in. is the net weight, 3/32 in. is the loss in cutting off or sawing, and .02% is the percentage relation of the scrap end, 4 inches to the total length of the rod, which is 16 feet.

The determination of the net weight is entirely a matter of judgment and must depend upon the amount of stock worked off a nipple, milled and threaded on both ends and drilled through for a gas way, would weigh about 35 per cent of the gross.

The labor charge for any article is dependent upon the operations, which are usually indicated by the master mechanic, as he has the responsibility of making the tools and the routing of the article would depend upon him also. It places the responsibility upon him, taking it from the estimator.

BISMUTH: ITS SPECIAL VALUE, AND CRYSTALLIZATION

SOME MICROSCOPICAL ASPECTS OF THIS VALUABLE METAL.

WRITTEN FOR THE METAL INDUSTRY BY JAMES SCOTT.

The solidification of a metal from the molten condition depends upon a process of minute crystallization, which is modified according to external circumstances. In a fluid mass of this kind various nuclei, or centres of attraction (the exact causes for which are still problematical), appear; and from these points particles possessing characteristic symmetry spring in certain directions, growing, as it were, outwardly, and thickening

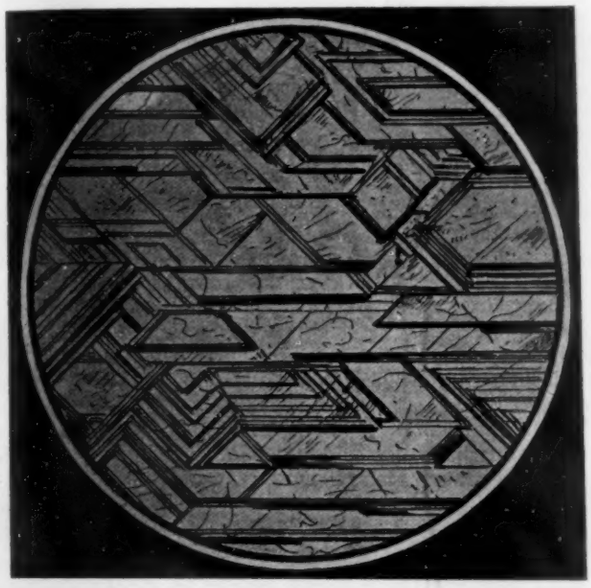


FIG. 1—1/24TH INCH OF THE BRILLIANT INTERNAL STRUCTURE OF BISMUTH REVEALED BY FRACTURING THE METAL, MAGNIFIED. THE CRYSTALLIZATION MERGES FROM THE HEXAGONAL TO THE CUBIC.

meantime. Little crystals join together endways, or by their faces, and produce thereby elongated ribs. The last formed particles are smaller than those preceding them; and there is a series of gradually diminishing sizes from the starting points to themselves.

The first solid portions widen by the regular deposition on them of further supplies of liquid metal; and, simultaneously, branches spring forth from the primary bases in geometrical relation to the remainder of the mass. Then the interstices between these hardning parts become occupied by still less pronounced crystals, separated from the molten metals contained in these cavities. Finally, as the whole cools there is usually a shrinkage (to which, however, exceptions occur) due to consolidation of the grains.

All metals crystallize, and whether they are melted singly or alloyed with others, they strive to obey the natural law to reform in a systematic manner. They tend to produce cubes, hexagons, octahedra, prisms, triangles, etc., and combinations of these shapes, into the varying details of which we cannot go at present; although it is advisable to acquaint oneself with as much as possible of the subject.

The more slowly a metal is cooled from the liquid to the solid state, the bolder and more perfect are the subsequent crystals. Now it is the desire of the manufacturer to prevent too conspicuous a crystallization, and therefore chilling is resorted to in many directions. The atoms, or molecules, are not given time to associate themselves together with exact precision, and they get more finely scattered, and well disposed in between one another, and provide a bulk result, which is superior from a practical standpoint.

When not hindered, the internal structure of large crystals resembles that of themselves. Suppose we have a cube, for example; this will be really composed of smaller cubes, and these of still smaller ones, and so on, right down to invisibility even when magnified. But the cube may possess the facility during its formation of being restricted in particular places, or accelerated in others, so uniformly as to furnish what looks like an entirely different object, and yet really belongs to the same group. An octahedron and a cube can be alternately changed into one another, to give one illustration.

Successive deposits of liquid on the existing solid particles provide superimposed layers, or laminæ, which later on blend indistinguishably together, and gradually enlarge the crystal.

It is quite common for crystal skeletons to appear in metals and alloys. They are due to the formation of a

FIG. 2—1/24TH INCH OF THE SURFACE OF FRESHLY MELTED BISMUTH, SHOWING INCOMPLETE CRYSTALLIZATION, MAGNIFIED. THE LINES DENOTE EDGES TO PLANES, SOME DISTORTED.

somewhat rigid framework, consisting of elongated, crossing aggregates of minute crystals. In the case of bismuth there are generally four sets of branches traveling in different directions. Of course, where each collection meets others, regularity is disturbed. These phenomena can be seen by letting a metal only partly solidify, and then pouring off the still molten portion. They also account for the beautiful designs frequently seen on the surfaces of shrinkage cavities in castings and ingots.

Various factors enter into the matter, and alter the grains from their predestined shapes, pressure gases, currents, and changes of temperature distort them as they are settling down. They also get forced into other arrangements when the margins of one solidifying group meet those of surrounding ones. All these phases affect the ultimate mass.

According to the nature of a metal or alloy, some particles hold together by means of adhesion, and others by cohesion. In the former instance they are, as it may be termed, simply stuck together mechanically, and are thus brittle and easily separated, whereas in the latter instance they are mutually joined by the influence of gravitational power, which binds each one firmly to its neighbor in such a way that none of them can be easily dislodged. After-treatment will often convert a weak result into a strong one.

The foregoing facts have a direct bearing on the value of a metal, as corrosion, disintegration, fractures, and other faults happen along the lines or planes of the respective substances. A mass may be regarded as having a definite integrity, but even the smallest of its grains is unequally balanced, and possesses alternating weak and strong areas, the existence of which is due to the initial building up procedure. They give way along these invisible portions, under stress, shock, chemical

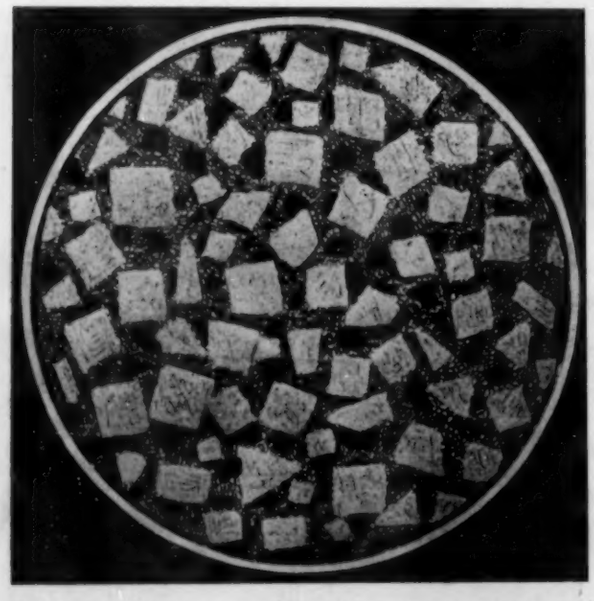


FIG. 3—1/24TH INCH OF THE SURFACE OF AN ALLOY OF BISMUTH, LEAD AND TIN, IN WHICH THE PSEUDO-SQUARES OF WHITE INDICATE THE BISMUTH CONTENT, MAGNIFIED. CRYSTALLIZATION HAS FREER EXERCISE.

operation, and so forth. By recognizing and understanding these facts, some metals can be so utilized in alloys that apparent demerits, founded only on habit, can be turned into merits of a very high order. This favorable result has happened with many metals of brittle formation.

What has been said applies in many ways to bismuth. This metal, owing to its brittleness, in some directions is not of much service, and yet has proved of the very greatest value in others. It confers hardness on some alloys; but still awaits further investigation to establish utility for this purpose. It is a highly important member of the fusible alloys manufactured for safety plugs in boilers; for taking casts of objects which would be destroyed by much heat, for amalgams and solders in dental work, for stereos, for type metal, and so on.

The bismuth which has been examined and experimented with was kindly supplied for the purpose by Messrs. Johnson, Matthey and Company, London. This metallic element is brilliantly white, and sometimes has a pinkish tinge. It melts at about 268° C. (514° F.), and crystallizes in the hexagonal system, but so closely does its structural behavior resemble the cubic that it was once regarded as belonging to that series.

Imagine that we have a pyramid with six sides, and then unite base to base with it a similar pyramid. Any section or slice cut across its longer direction will have a hexagonal appearance, and leave a corresponding form of plane, while the longitudinal outline, and piece removed parallel therewith, will be rhombic. But alternate triangular faces of the double pyramid get so correctly built up that a rhombohedron, almost approaching a cube in shape, is produced. This is how to explain the existence, in some bismuth specimens, of relief patterns and lines, which form perfect rhombs, while in alloys the bismuth particles are almost square, apparently indicating the faces of slightly tilted cubes. The first are unfinished faces, or else cleavage planes, of the hexagonal crystals mentioned, whereas the latter relate more directly to the modified cube due to further crystallization. No. 1 shows bismuth crystal inside the metal, and No. 2 outside it.

A very valuable feature of bismuth is that it expands considerably on cooling and solidifying. This allows sharpness to be obtained in casts, and so on. A very good alloy consists of bismuth 70 parts, lead 15 parts, and tin 15 parts. On being properly etched with nitric acid this presents the appearance shown in No. 3, the crystals of bismuth, which separate first, being white, while those of tin are black (and not always very plain), and the particles of lead are also dark. I purposely made this alloy. Rose's alloy and Newton's alloy belong to the bismuth lead and tin series.

These particulars will explain why bismuth is more suitable in some directions than in others, and cannot be surpassed for certain applications.

Bismuth is very resistant to oxygen and atmospherical influences.

THE SWISS GUN METAL FINISH.

The method used in producing the Swiss gun metal finish such as produced by concerns in Connecticut and other sections consists in applying to the cleansed and polished steel surface a mixture of nitric and hydrochloric acids, sulphate of copper, perchloride of iron and water.

This mixture is applied to the articles to be finished by means of a sponge or by immersion. The articles are then allowed to dry in a warm room for a short time, and then immersed in boiling water for from 15 to 20 minutes.

It will be found that after the articles are taken from the water that they will be covered with a heavy coating of a dark red rust, inclined to be somewhat black and which is a black oxide of iron. When the articles are dry the rust may be removed by scratch brushing. Use a soft steel wire brush of the crimped wire style. After removing the rust a rich blue black finish will result. The articles should finally be coated with a thin coating of linseed oil.

The formula for the bronzing fluid as given in Rychner's process for obtaining a Swiss gun metal finish consists of the following:

Water.....2 quarts or 2000 grammes
Strong nitric acid.....1 ounce or 27.0 grammes
Strong hydrochloric acid..¼ ounce or 7.5 grammes
Strong sulphate of copper..¼ ounce or 7.5 grammes
Strong solution of perchloride of iron.....
12 ounces or 333.5 grammes

Sometimes it is necessary to go over the steel surface a second time with the bronzing tincture, but this is a matter that can be determined by experimenting.—C. H. P.

ALUMINUM AND ITS ALLOYS

A Microscopical Examination of Some of the More Important Compounds of the Light Metal.

Prepared for The Metal Industry by Charles H. Eldridge.
Metallurgist Chile Exploration Company Laboratories.

The following photomicrographs with their description should prove of great value to those engaged in the manufacture of the best known and most widely used alloys of aluminum and copper.

FIG. 1. VIRGIN ALUMINUM, 200 DIA. ETCHED WITH CONC. NITRIC ACID. CU = 0.15% FE = 0.31% SI = 0.92. OL (BY DIFFERENCE) = 98.62%.

Fig. 1. Specimen polished on broadcloth covered with wet tripoli. After warming on hot plate a drop of conc. nitric acid was left on polished surface for 2-3 seconds. This photo serves mainly to show that surface of virgin aluminum is darkened completely when etched with conc. HNO_3.

FIG. 2. VIRGIN ALUMINUM, 200 DIA. POLISHED ONLY.

Fig. 2. Same specimen as in No. 1. Next to last polish on broadcloth wet with tripoli and water. Final polish with broadcloth covered with dry tripoli caked upon it. This left metal surface dark in color but high in lustre, resembling bright blued steel. Specimen was not etched. The microscope shows the impurities as white lines bounding grains of pure aluminum. Total impurities in this case = 1.38%. Specimen seems to be coarse grained and brittle.

Fig. 3. Cast in steel mould (thus chilled) in bar ½" dia. × 8". Final polish on broadcloth covered with slightly moistened tripoli. This left surface smooth but darkened. Etched by treating with 1 to 1 HCl for 2-3

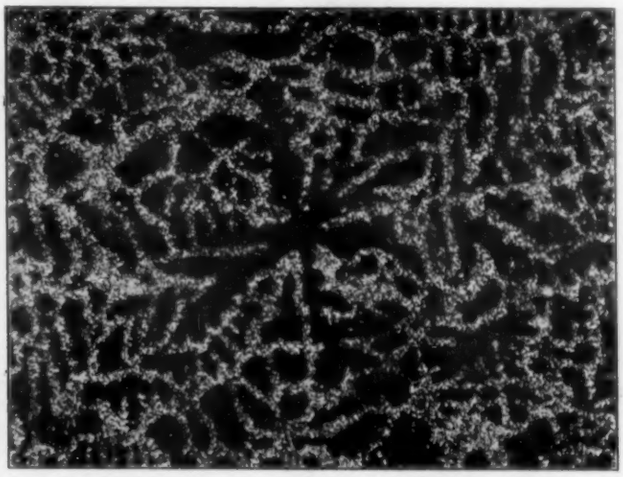


FIG. 3. ALUMINUM COPPER ALLOY, 200 DIA. CU = 5% ETCHED WITH HCl.

sec. Black grains are solid solution of copper in aluminum. White boundary lines are presumably an eutectic of Al Cu_2 compound and the solid solution. This percentage is claimed by some authorities to give the highest tensile strength of the low density copper-aluminum alloys.

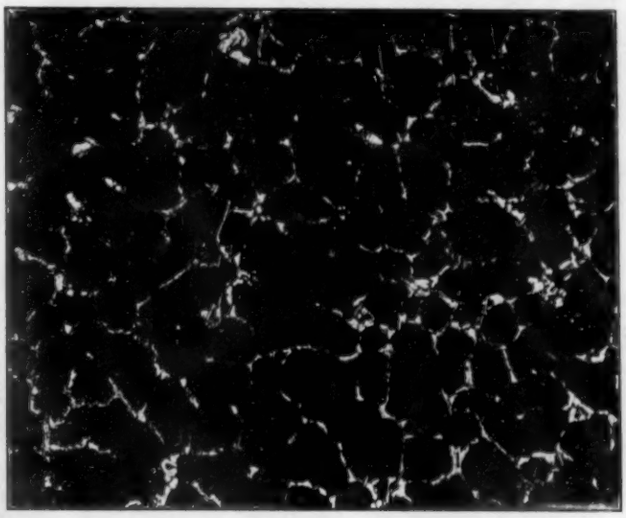


FIG. 4. ALUMINUM COPPER ALLOY, 200 DIA. CU = 7-8%, ETCHED WITH HNO_3.

Fig. 4. Polish same as in No. 7. Warmed on hot plate until just too warm to hold in fingers. Next add a drop of conc. HNO_3 and wash off after 2-3 sec. This should leave surface slightly frosted. White lines presumably are Cu Al_2 compound. Black is solid solution of copper in aluminum. This alloy is the No. 12 alloy of commerce, so widely used in automobile and aviation engines. Sp. Gr. = 2.86.

Fig. 5. Same specimen as in No. 9. Faulty repolishing left grain centers dark. Polishing on broadcloth covered with rather dry tripoli, left bright silvery surface. Etched with conc. H_2SO_4 for 2-3 sec. Note crystals remain bright.

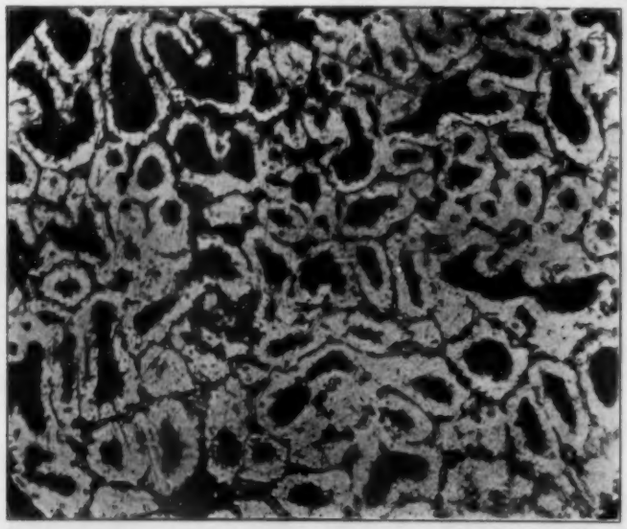


FIG. 5. ALUMINUM COPPER ALLOY, 200 DIA., CU = 7-8%, ETCHED WITH H_2SO_4.

Fig. 6. Cast in large pigs in open iron mould. Not etched. Polished only with wet tripoli on broadcloth. White is compound Al Cu_2. Black is solid solution of copper in aluminum. Note areas of the eutectic Al Cu_2 and solid solution. The eutectic is supposed to be 32-33% copper foundry alloy to be diluted with virgin aluminum to give 7-8% copper.

FIG. 6. ALUMINUM COPPER ALLOY, CU = 50%, DIA. 225. POLISHED ONLY.

Fig. 7. Same casting and polishing conditions as in No. 23. Etched while warm with conc. HNO_3 as in No. 9. Light areas are Al Cu_2 compound. Dark dendrites an eutectic of Al Cu_2 and solid solution of copper in aluminum.

NOTES.—For 225 dia. 8 mm. objective and 5 × ocular were used. For 200 dia. 16 mm. objective and 5 × ocular were used. For all specimens.—First grind on emery wheel, smooth off on various grades of emery cloth, grind flat with wet emery dust on duck, and then polish on broadcloth with wet tripoli. Speed of polishing disks about 500 r. p. m.

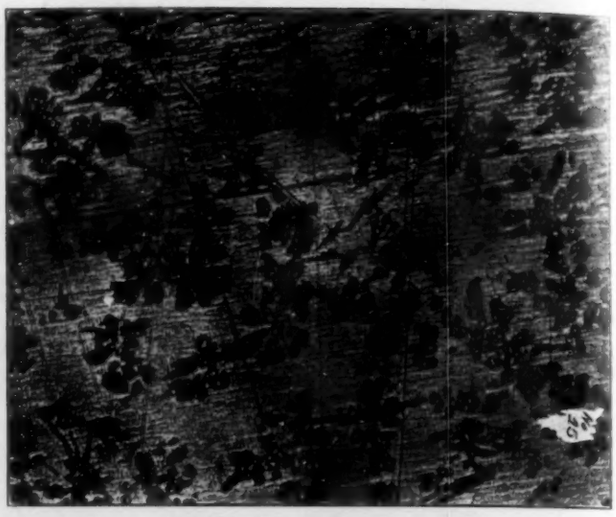


FIG. 7. ALUMINUM COPPER ALLOY, CU = 58.0%, DIA. 200, ETCHED WITH HNO_3.

Fig. 8. Aluminum = 9.14%. Final polish with wet rouge on chamois. Etched with conc. HNO_3 for 2-3 sec. Most useful of copper high alloys.

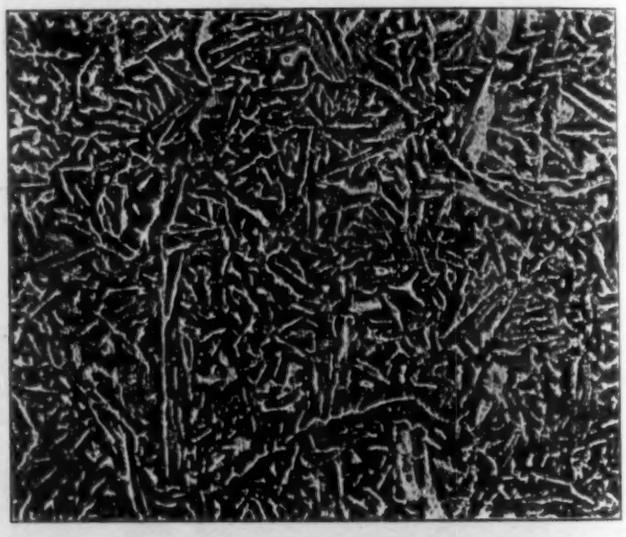


FIG. 8. ALUMINUM BRONZE, CU = 90.86%, DIA. 200, ETCHED WITH HNO_3.

BLACKENING BRIGHT IRON AND STEEL.

According to the Bayerisches Industrie- und Gewerbeblatt, a fine, uniform black color can be imparted to polished articles of iron and steel by rubbing them over with a rag soaked in linseed oil, so that only a thing regular film of oil is left (over-oiling in places gives a patchy result). The parts are next dusted over with fine white charcoal ash, and tapped gently to dislodge any surplus. If the oiling has been properly done, the surface will be covered with a uniform layer of fine dust. The articles are placed in a sheet iron box, over the fire, or are heated in a hardening furnace, care being taken to shield them from the direct action of the fire. In a short time the film of oil will begin to run, and will soak into the ash, which turns yellow and does not become white again until the oil is burnt off. When this occurs, the articles are taken out, and placed to cool, the dust being removed with a brush, and the surface rubbed lightly over with ordinary engine oil, which is wiped off with a dry cloth.

ELECTRO-PLATING AND ITS RELATION TO THE MANUFACTURE OF PHONOGRAPHS AND PHONOGRAPHIC RECORDS

A Series of Articles Giving Practical Information Regarding the Finishing of Metal Parts. Part 2.

Written for The Metal Industry by S. Herrick.

It is with a feeling of great pleasure that I am able to write an article on so fine a subject as a phonograph record, how it is made, and the importance of the plating industry in connection with the making of same. In this second article I will endeavor to illustrate how the voice is reproduced, how it is reproduced from one operation to another, and also how the finest voice may be lost through careless handling in the plating room, as the plating room is the most essential department in the making of a phonograph record. At the present time there are but few manufacturers of records, but a field may be open soon whereby they can be manufaceured by many new concerns and thus also open up a field for the electro-plater, especially those who have had experience in galvano-plastic work. Of all the different kinds of plating I doubt if there are any that are as interesting as this, or have such a field for study as the phonograph record line.

As I mentioned in the first article, new industries have new problems, so has the phonograph record line its own problems, some of which have already been worked out, but there are others which will take time and patience and a great amount of study to overcome. A great many of the everyday troubles in the general plating line can be easily seen by means of the eye, but in the manufacture of phonograph records it is those that are not seen but are heard and are only visible under a powerful glass. Then again there is a great field open for the study of acid copper solutions, the various actions of the same under varying temperatures, the action of such a solution upon different wax compositions, the different actions of the solution at different densities and maintaining a strong deposit at the different seasons of the year. Then in making records the solution cannot be used in the same condition as in the electro-typing industry where a hard copper is desired. Then again there is a field for the study of the production of electrolytic nickel and also a possible one for cobalt plating. Another point which could be improved on is the oxides used, while still another is the study by all platers of pitting in the nickel solution, and so we could go on naming various improvements that could be made, but it would take up a great many issues of The Metal Industry to publish and digest them.

It has been my privilege for some time past to make a study of the plating industry in regards to the manufacture of phonograph records, and also to observe the extensive field open for improvement. In my travels among the men who are at present connected with this line I often hear it said, "We have overcome this or that trouble," but as I view the ever increasing pile of scrap copper from rejections, I cannot help but say like the Scotchman said, "I ha'e me doubts." One reason why the record business has not been studied by practical platers along practical lines is because a great amount of secrecy has been maintained by the men connected with it. However, like all other trades that have been secret in the past, it will have to be an open book in the future, and it will only be a short time when the plater will be called upon to solve the problems that face the manufacturer at the present time. Even now the manufacturers are looking to the plater for assistance, and I believe the firms entering this field will have easier sailing than some of those who are in the field at present.

In making a phonograph record of the disc type the voice or music is first recorded on a wax disc, which is about one and a half inches more in diameter than the record desired. These wax discs vary from three-quarters of an inch to about one and a quarter inches in thickness and are called the master wax. Great care must be taken in handling these discs, for they are easily broken and cost a great amount of money to replace, sometimes never being replaced, while in some cases the loss of time is so great that it amounts to a considerable loss in future sales, especially on popular selections.

After the master wax is finished it is then turned over to the plating department where it is put through the different operations necessary to produce a copper master. It is here that a field is open for a great amount of study in regards to the action of acid copper solutions on wax compositions. At the present time it is very hard to obtain a certain kind of wax which was previously used in making the master wax, so some firms are using substitutes which decompose extensively when in the copper bath. I have seen some wax masters that were so bad that the solution reached the lines of music and destroyed the selection.

In preparing the master wax for the bath suitable racks or holders must be made to support the wax discs firmly while in the bath, and great care must be used so as not to destroy the surface by the least mark. After the racks or holders are ready the wax is then coated with graphite. This is an operation where a light hand is a great asset, and woe betide the man who thinks he is handling cast iron, for the lines of a record are fine, but the tone waves in the line are finer and a man must have a powerful sight in order to see the lines without the aid of a powerful magnifying glass. Therefore, when graphite is being put on the wax special care must be used not to fill in the line and the worker must not think that he is rubbing on a plaster or some other hard substance and rub out the lines. It is very difficult for me to explain the whole method of putting the graphite on the wax, as no two men work alike. I have seen the results of a number of men—some were good and some were bad. Practice is the thing necessary in order to obtain good results, and although you may practice it must never be forgotten that patience is required, for it certainly will be needed.

When the wax is ready for the bath it must be fastened to the rack or holder and placed in the bath until covered, after which it is taken out and rinsed off to remove any small particles of foreign substances that may be on the face. It is then returned to the bath and allowed to remain there until finished, which will be from twenty-four to forty-eight hours, according to the thickness required. When the desired thickness is obtained, remove the wax from the bath and carefully lift the copper from the wax and the resulting article will be what is known as the "copper master."

As we have now reached the stage where the copper master has been produced I think that before going on it would be well for us to review the plating solution. The acid copper solution is one that is not properly understood at the present time and only by vast experiments is it possible to understand it. At the present time if you ask three platers for a formula for an acid copper solution I do not believe there would be two formulas alike. Some platers use one agent, some another, some one density

while some another density. However, I will give the one that I have found to give the best results, and which is as follows:

Copper sulphate .....30 ounces per gallon
Sulphuric acid ..... 8 ounces per gallon

The solution should have a specific gravity at 77 degrees Fahr. of 20° B.

I do not recommend the use of any other agent such as alum, molasses or any of the colloidal substances, inorganic compounds or organic substance. Although some of these materials increase the tensile strength of the deposit and may be all right for use in an electrotyping solution, but they are not suitable for phonograph record work where a very strong deposit is required.

The master plate has now been completed, so my next article will relate to the manufacture of the next plate or what is known as the "mother plate."

(To be continued.)

A DOUBLE FLIGHT PROJECTILE

A Death Dealing Instrument Is Designed by a Brass Foundry Superintendent.

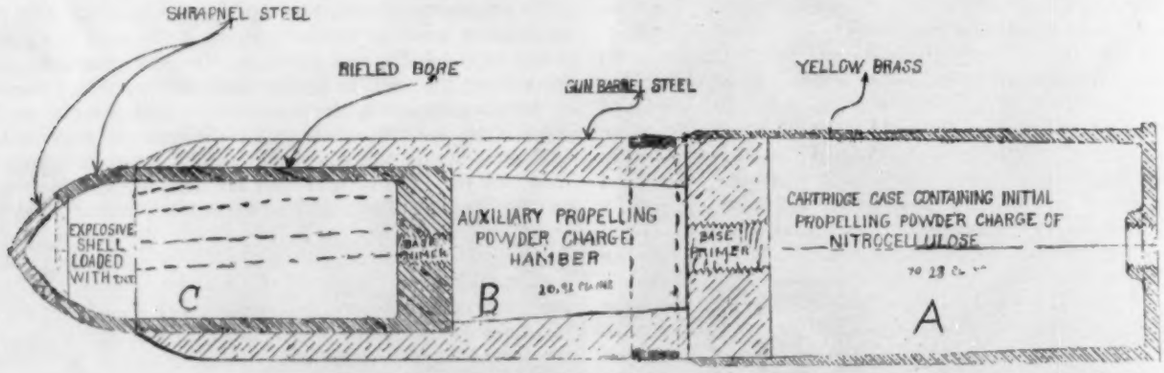
To the Editor of The Metal Industry:

Herewith enclosed please find a study drawing of a "Double Flight Projectile" which I imagined was originally conceived by the writer.

When the news of the 74 mile flight of the projectiles "visiting" Paris was flashed to this country on Saturday, March 23, the news not only saddened me because the gun was operated from the wrong side of the battle lines, but I awoke to the all too evident fact that the Huns had "beaten me to it," as we say at the club.

Since this happening, we have read that the idea of a compound projectile is about as old as Coney Island, and at least one good New Yorker had been granted letters patent over two years ago for the very device that I was about to spend some of my hard earned money to be expended on a search of the Patent Office files before asking that a patent be granted. Of course visions of the great help this device would be to our country, and the millions of dollars flowing into my pockets have been dissipated by this Hun trick, but the supreme consciousness remains "that 'twere better to have tried and lost than not to have tried at all."

W. H. PARRY.
Superintendent National Meter Company.
Brooklyn, N. Y., March 29, 1918.



W. H. PARRY'S IDEA OF A LONG DISTANCE PROJECTILE.

The object in designing this projectile is to increase the range of our 6 inch to 14 inch battleship rifled cannon, particularly for bombardment purposes, in that by its help it is hoped to outrange any land defence guns possessed by the enemy. Assuming, of course, that our guns and projectiles are the equal of any made by them.

There is a possibility that this projectile can be used for other than bombardment purposes, but for the present no claims are made as to its efficiency, on any other work. By consulting the accompanying sketch it will be noted that this device is made up chiefly of three major sections, the main cartridge case A containing the initial propelling powder charge (this section in the large bore guns could be dispensed with as its place would be taken by the usual ammunition charge); B the auxiliary cannon containing the assisting or relaying powder charge, and C the explosive projectile filled with shrapnel, guncotton, or T. N. T.

This projectile on being placed in the gun is expelled from it on the ignition of the main charge. Parts B and C pass through space until their velocity slackens to a predetermined pace, when the timing device explodes the auxiliary powder charge, thus driving the explosive projectile C with an increased velocity and resulting increase of range, to its destination.

The success or failure of this device hinges entirely on the action and reaction of the auxiliary cannon at the moment its powder charge is exploded, as it is a moving body and is not governed by the usual ordnance rules such as apply to stationary cannon and projectiles.

There is sufficient merit in the scheme to believe that an increase in range is possible, coupled with some degree of accuracy.

To make the auxiliary cannon dependable, the material of which it is made must be of the toughest steel obtainable, so that it will not fracture at the time of explosion. This is possible only when the projectile fitting into its rifled barrel is of such a fit that it will leave its encasement easily at the time of explosion, thus permitting the charge to exert a goodly proportion of its force on its rear end.

The cost of experimenting with this device need not be very great, as no alteration in the gun barrels now in use is necessary, for it can be made to fit any breech and bore.

Again the preliminary experimenting can be conducted through the medium of an ordinary shoulder rifle or fowling piece or in fact any gun equipped to use a cartridge other than those with revolving cylinders.

SPELTER FOR HIGH GRADE BRASS

MEMORANDUM RESPECTING THE QUALITY OF SPELTER SUITABLE FOR THE MANUFACTURE OF CARTRIDGE BRASS AND OTHER HIGH GRADE BRASS.

On December 21, 1917, a report of an investigation into the quality of spelter suitable for cartridge brass was submitted in the name of nine of the large zinc producers to B. M. Baruch, chairman of the Committee on Raw Materials of the War Industries Board. This report, which was compiled by W. R. Ingalls, has just been made public and constitutes very interesting matter for users of spelter. A synopsis of the report is as follows:

Mr. B. M. BARUCH, Chairman,
Committee on Raw Materials,
War Industries Board,
Washington, D. C.

Dear Sir:—On November 23 a group of zinc producers addressed a letter to you with reference to the quality of spelter suitable for the manufacture of cartridge brass, and referred to a communication by the Brass Committee of the Advisory Commission, Council of National Defence (of which Mr. Charles F. Brooker was chairman) in which the committee advised that spelter containining not more than 0.10 per cent. to 0.12 per cent. lead, not more than 0.02 per cent. iron, and with a cadmium content even up to 0.50 per cent. may be relied upon to make good cartridge brass; and offered to lay before the experts of the Army and Navy departments technical and other evidence in support of this.

Referring to your request, through Mr. Pope Yeatman, Consulting Engineer of the War Industries Board, that we should do this, we now submit to you a memorandum prepared in our behalf by Mr. W. R. Ingalls, who has considered the data that we have put in his possession, besides data that he himself has collected. We need add to this only that we endorse fully the statements, conclusions and recommendations in Mr. Ingalls' memorandum, and we submit it as the united views of the undersigned zinc producers.

Yours very truly,

AMERICAN METAL CO.
AMERICAN SMELTING AND REFINING CO.
AMERICAN SPELTER CORPORATION.
AMERICAN ZINC, LEAD AND SMELTING CO.
BUTTE & SUPERIOR MINING CO.
EAGLE-PICHER LEAD CO.
GRASSELLI CHEMICAL CO.
UNITED STATES SMELTING, REFINING AND MINING CO.
UNITED ZINC SMELTING CORPORATION.

MEMORANDUM RESPECTING THE QUALITY OF SPELTER SUITABLE FOR THE MANUFACTURE OF CARTRIDGE BRASS AND OTHER HIGH GRADE BRASS.

BY W. H. INGALLS.

SUMMARY.

Failure of cartridge cases by seasoning-cracking and splitting is due, according to the consensus of opinion among brass metallurgists, to the release of mechanical strains introduced during the manufacture. Possibility of impurities, especially cadmium, as a contributory factor, is by them dismissed. Cartridge brass made from the highest grade, non-cadmiferous spelter is subject to season-cracking. Experiments with brass into which cadmium in varying amounts has been purposely introduced exhibit no increased tendency toward seasoning-cracking as compared with brass free from cadmium. There is some evidence to indicate that cadmium in brass may improve its mechanical properties; and the opinion is entertained by some brass metallurgists that some cadmium in spelter may be beneficial in brass manufacture. However, in making brass with spelter containing high cadmium, but little cadmium—not more than 0.02 per cent.—is to be found in the brass, and its effect is regarded as inappreciable one way or another. The bulk of the cadmium is volatilized from the brass pot and is found largely in the flue dust therefrom. The entire subject of cadmium is practically ignored by the most experienced brass-makers. The influence of lead and iron in brass is well understood and these impurities are covered by precise specifications. The French Government has supplied American contractors for cartridge discs with large quantities of spelter containing up to 0.4 per cent. lead plus iron, without any specification as to cadmium. The British Government, which in the early years of the war, required "High Grade" spelter, has recently liberalized its specifications and for cartridge brass now takes spelter containing up to 0.3 per cent. lead and does not stipulate anything as to cadmium. American producers have supplied both of these governments, and also the Russian and Italian, with large quantities of such spelter, without receiving any complaint. If the manufacture of cartridge brass during the war had been limited to "High Grade" spelter the supply would have been far from sufficient. Finally, and most conclusively, the Brass Committee of the Advisory Council of National Defence, comprising the leading brass manufacturers of the United States, advised the United States Government that with the use of spelter containing not more than 0.10 to 0.12 per cent. lead, 0.02 per cent. iron, and up to 0.5 per cent. cadmium, they could make good cartridge brass, and included brands of spelter refined by redistillation among those which they considered suitable. This recommendation by the Brass Committee is in itself considered a sufficient reason for the liberalizing of the spelter specifications of the United States, and by comparison with what the French and British are actually doing is regarded as being very conservative. Indeed, such spelter will make brass coming within the limits of toleration of impurities in the existing specifications of the Ordnance Department of the Army of the United States.

INTRODUCTION.

The producers of spelter whose letter transmits this memorandum desire and recommend that the U. S. Government liberalize its specifications for spelter. They do not ask any change in the definition of what the Navy Department calls Grade A and the trade calls "High Grade" spelter. They believe that for the manufacture of slush castings and for galvanizing telegraph wire it is necessary to specify such spelter. But they believe also that such spelter is unnecessarily pure for the manufacture of brass, even of the brass that is most exactingly required for ammunition purposes; and they ask that the Government accept for brass manufacture spelter that contains not more than 0.12 per cent. lead and 0.02 per cent. iron, and up to 0.5 per cent. cadmium (although they are willing that the cadmium limit be fixed at 0.35 per cent. if it be so desired). Their reason for proposing those maxima is the communication addressed to Mr. Bernard M. Baruch, chairman of Committee of Raw Materials of the Advisory Council of National Defence, under date of April 16, 1916, by the Brass Committee

appointed by him, in which this Brass Committee (comprising eminent brass-makers) state that they consider spelter of such composition to be suitable for the manufacture of cartridge brass (see copy of this letter, Appendix A); and the producers' own knowledge that they generally can refine spelter within those limits, but cannot generally comply with the specifications of Grade A. In making this request and recommendation, however, these producers are wishful to submit all reliable evidence, both pro and con, that can be found and hope for nothing more than a decision of the case on its merits.

ARGUMENT.

The argument in favor of liberalizing the specifications for spelter is based upon the following evidence:

1. The Brass Committee of the Advisory Council of National Defense has stated officially, in reply to an inquiry of the Paymaster-General of the Navy, that spelter containing not more than 0.10 to 0.12 per cent. lead and not more than a moderate amount of cadmium will make good cartridge brass; and they add that they should have little hesitancy in using spelter containing up to 0.5 per cent. cadmium.

Thus is expressed the united judgment of the leading brassmakers of the United States, who have had immense experience in the manufacture of cartridge brass and all other kinds of brass who have been responsible for their products and have known that their products have been good. Drawing from their experience, they advised the U. S. Government in a time of great solemnity. The case might reasonably be left to rest on this alone; but we go further.

2. The Ordnance Department of the Army of the United States in its existing specifications for brass tolerates iron up to 0.05 per cent., and lead up to 0.07 per cent. The spelter recommended by the Brass Committee will easly make brass containing impurities within those limits. Indeed, such brass may be made with spelter containing about 0.2 per cent. lead.

3. The French Government has bought of American smelters much spelter containing up to 0.4 per cent. lead plus iron (with the understanding that the iron should not be more than 0.02 or 0.03 per cent.) without any specification whatsoever as to cadmium; has delivered this spelter to American brass-makers which had contracted with it to make cartridge discs; the brass-makers have made such discs out of such spelter, and both parties have been satisfied as to the excellence of the product.

4. The British Government, up to the end of 1916 (and perhaps later) was a large buyer of Grade A spelter, although it also bought prime Western spelter and caused it to be refined by redistillation. Certain of its specifications for "High Grade" spelter were extraordinarily severe as recently as early in 1917. Thus, it was at that time demanding spelter with not more than 0.05 per cent. lead, 0.025 per cent. iron and "not more than a trace of cadmium." Not even would electrolytic spelter conform to those requirements. During 1917, however, the British have become more liberal and I was officially informed from London under date of Dec. 8, 1917, that there is now a toleration of 0.3 per cent. lead, with no mention of cadmium, in spelter for cartridge brass.

5. American producers of spelter have furnished to the British, French, Russian and Italian governments many thousands of tons of cadmiferous spelter containing up to 0.3 per cent. lead (besides what has been delivered to contractors in this country), which those governments have presumably used for the manufacture of cartridges, and no complaint regarding the spelter has been received by the producers who have supplied it.

6. Up to the end of 1916 but relatively little electrolytic spelter had been produced. Without attempting any statistical comparison, for which data are unavailable, mere consideration of the number of concerns able to produce Grade A spelter and of the quantity of ammunition consumed is convincing that the bulk of the ammunition must have been made with other classes of spelter.

With a case so thoroughly established by the foregoing statements of fact, which reflect experience of the most extensive nature and which are capable of easy verification, it is strange that anybody should uphold specifications, or precedents, or conservatism, or whatever it may be called, that limit the toleration of combined impurities in spelter for cartridge brass to 0.1 per cent., or should aim to limit the use to spelter produced in ways that are peculiar to a few producers. The contentions in behalf of such restriction are as follows:

A. Other spelters are likely to produce brass that is subject to deterioration by seasoning-cracking.

B. Cadmium in brass is, or may be, responsible for the conditions that cause season cracks to develop, or may be contributory to such deterioration.

C. Spelter refined by redistillation is not virgin spelter.

None of these intimations or insinuations are supported by the experience of the best brass-makers, nor do they enter into their beliefs. The failure of brass by seasoning-cracking was observed many years ago, in brass made for many purposes, when the common constituents of brass for such purposes were Lake copper and "High Grade" spelter. Among brass metallurgists cadmium is dismissed from considerations of responsibility for seasoning-cracking. Both of these matters will be discussed at more length further on in this memorandum. I may pause here, however, to take up the question of virginity.

WHAT IS VIRGIN SPELTER?

The standard specifications for spelter prescribe that it must be virgin spelter. Virginity means unused, and virgin spelter means metal that is derived directly from ores. The impurities that may enter into spelter when made directly from ores are well known and well understood. Not so with respect to impurities that may enter into spelter refined from scrap and junk of unknown origin. It is conceivable that such spelter might fall easily within the limits of "Intermediate" or even "High Grade" and yet contain some very undesirable impurity. In order to guard against such surprises the limitation to virgin spelter is introduced. But spelter that is refined by redistillation from prime Western spelter that is distilled from ores is just as much virgin spelter as its antecedent. It was never previously in use. It is simply advanced another step in the metallurgical process. Electrolytic spelter is obtained directly from the ore in the form of cathodes, which have to be remelted; i. e., advanced another step. American brass-makers have used spelter refined by redistillation in large quantity with satisfactory results. In fact, the Brass Committee expressly states that among the brands of spelter that fulfill its requirements for cartridge brass are "the best brands of the American Metal Co.," which are refined by redistillation.

The balance of the report is taken up with records of articles published in the trade press, papers and discussions before scientific societies and the opinions of experts as to the effects bad and good of cadmium* on high grade brasses. Copies of the report may undoubtedly be obtained from W. R. Ingalls, 36th street and 10th avenue, New York City.—Ed.

*THE METAL INDUSTRY published an editorial on this subject in July, 1916.

EDITORIAL

Vol. 16 New York, April, 1918 No. 4

THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, COPPER AND BRASS, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS' REVIEW.
Published Monthly

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THE METAL INDUSTRY PUBLISHING COMPANY
(Incorporated)

Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE $1.00 PER YEAR, POSTPAID TO ANY PART OF THE WORLD. :: SINGLE COPIES, 10 CENTS
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THE METAL INDUSTRY is a member of the Audit Bureau of Circulations

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THE THIRD LIBERTY LOAN

The third Liberty Loan tocsin is now being rung and calls to all bona-fide Americans from coast to coast, and from Canada to Mexico, to gather with their dollars for the defense of their country in crisis. Bonds to the value of three billions are offered for purchase —bonds that carry with them the literal meaning of the word, for they shall bind together for safeguarding and permanent preservation the freedom that has come down to us from our liberty-loving forefathers.

Bonds are bullets. Bonds are rifles. Bonds are cannon. Bonds are shrapnel and shell and ships and torpedoes and submarine destroyers. They mean food for our soldier men in France and the thousand and one necessities of a grim and relentless war. They mean the annihilation of Teuton military autocracy, the destruction of kultur-fetish that has announced the subjection of the entire world to a Germanized bossship. To stop the Kaiser all of these war accessories are needed. The only way to get them is through the billions of dollars represented by the bonds.

The tones of the bond tocsin will reach the laggard and lukewarm, as well as the red-blooded and sacrificing American. To the former they must have a searching, if not an accusing appeal. They must of necessity convey this question to the man or woman who has been enjoying this country and its priceless privileges as a matter of course:

"Have you fought, wrought, or bought?"

Millions of us cannot go across to the trenches of France. Age and physical condition may be a bar that cannot be surmounted. God knows, in hundreds of thousands of pulse-stirring examples, the spirit is willing but the flesh is weak—and not the weakness of the goose-flesh variety. These great hearts have made good through their work along patriotic lines. They are the soldiers of home-help and home-preparation. They have wrought. Also have they bought—Liberty Loan bonds. The patriotic worker and the bond buyer are found continually in company. The coming third loan will not have to appeal long or hard to them.

Take the question home American men and women, Are you among the recreants who must answer "No" to all three words of the query: "Have you fought, wrought, or bought?" You are pardoned for not fighting if you honestly cannot. Those of you who have wrought for the good of the country in its crisis, may be praised for having done a good share of your bit. There is little doubt that you have bought if you have wrought. But if your work is merely of the smug, personal sort, can you defend your apathy? Hardly.

Suppose we say to those who have neither fought nor wrought. Here is the chance to even up your re-

missness. Stick to your personal pathway in this critical time if you will. Make no effort in the way of personal service to help your country in its moment of peril. But in the matter of buying Liberty Loan Bonds—shall you not prove to your conscience, if not to your countrymen, that the depths of your dormant patriotism have been reached and that you will dedicate your dollar to the land that every freeman loves.

There was an hour when Paul Revere thundered down a road near Lexington crying "Alarum" and calling to arms. There is another Paul Revere galloping toward us now, bearing aloft a Liberty Loan Bond. This bond epitomizes the new American alarm—the call of 1918. It cries that if we do not heed its message, and embrace its opportunity, we may perish.

Shall we be helots of the Hun? Have you fought, wrought, or bought? There is no answer to these questions like the answer a Liberty Loan Bond carries.

WHERE WILL GERMANY GET COPPER?

Germany is hard-up for copper and where she is to get the necessary tonnage to carry on the war is one of the hardest nuts she has to crack. A brief resumé of the world's production of copper just prior to and during the war will throw considerable light on the subject.

In 1913 the entire copper output of the world was 1,005,978 metric tones (a metric ton is equal to one and one-tenth English ton). Of this the United States alone produced 555,990 or more than one-half, Japan was next with 73,152 tons. Then came Mexico with 58,323; Spain and Portugal, 54,696; Australasia, 47,328; Russia, 34,316 and so on down the list; Germany being eleventh on a list of fourteen with 25,308 tons.

In that year of 1913, the last year of normal consumption, Germany's mines supplied only about one-twelfth of her consumption. The United States supplied Germany, Austria, Belgium and Holland with 222,658 tons; from the mines of Germany, Austria, Serbia, Turkey, etc., came about 30,000 tons more and from reclaimed copper came about 50,000 additional tons. This makes a total supply for the year of 1913 of a trifle more than 300,000 tons.

Now how has the abnormal demand for copper created by the war increased its production? The world output for 1917 was 1,413,056 tons, more than 40 per cent greater than in 1913. In these four years the production in the United States has jumped from 555,990 to 856,570 tons; that of Japan from 73,152 to 124,306; Canada from 34,880 to 50,351. In countries friendly to the allies there was the same great increase. Chile, for instance, mined 39,434 tons in 1913 and 75,345 tons in 1917, while Peru went from 25,487 to 45,620. It is estimated that Germany was able to so increase her production that she had 45,000 tons in 1917.

Thus it is apparent that in 1917 the nations belonging to the Entente Allies produced within their own borders more than 1,000,000 tons of copper and that they had free access to a world market which had for sale and additional production of more than a quarter of a million tons. That this million and a quarter tons did not satisfy a demand made abnormal by a world war is shown by the fact that, although the output had increased more than 40 per cent in four years, the price has continued to advance.

It has already been pointed out that Germany's normal consumption in peace times was approximately 300,000 tons per year. What has she had to draw on to meet the abnormal demands of war times? At the outbreak of the war it may be assumed there was in Germany copper in stock and in manufactured goods about 130,000 tons. In addition to this there was in store, subject to sale some little copper that was seized by the government; this might have amounted to about 25,000 tons. And the German Government no doubt had assembled for instant use by the army and navy a vast supply aggregating perhaps 100,000 tons. This makes a total of 261,000 tons that the government could muster at the outbreak of the war. To this amount must be added what has been taken from occupied portions of Belgium, France, Serbia, Roumania and Russia and we know the stripping has been most complete, extending to roofs and statues. What this metal amounts to it is impossible to estimate, but that it is far from supplying Germany's demand for copper is plainly indicated by the fact that irreplacable relics have been sent to the smelteries.

Now add to this fixed supply of copper the output from Germany's own mines. This was estimated to have been 30,480 in 1914, 35,000 in 1915 and 45,000 for the years 1916 and 1917. The total is 155,480 tons for the four years or less than one-fifth of the United States production for the single year of 1917. During the years 1914 and 1915 there was a very large increase in the exports to Italy, Norway and Sweden from copper fields controlled by the Entente. It was much in excess of the normal local consumption and it is to be presumed that a considerable portion of it got through to the Central Powers.

In figuring on the total supply of copper available for Germany we must figure on the production from Scandinavia. This, from authentic figures, will have amounted to 33,127 tons for the last four years, but it is inconceivable that she could have gotten it all.

This brings us to the last possible source of supply for Germany which is Russia. If Germany can make good her inroad into Russia, if she can extend her authority over vast territories beyond anything she has yet accomplished, it may be that she can add to her supply the output of Russia. In the last year of world peace this was, as stated, 34,316 tons. Since then, through Russia's disorganization, the output has steadily decreased until it has become less than one-half, the 1917 output is estimated at 16,000 tons. Germany then, as said at the beginning, is surely hard-up for copper as she has no other possible source of supply beyond those we have enumerated.

CORRESPONDENCE AND DISCUSSION

WE CORDIALLY INVITE CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY

ELECTRO-PLATERS IN THE WAR

To the Editor of THE METAL INDUSTRY:

It may be of interest to you to know that I sailed in the same convoy that the Tuscania was in when she was hit and sunk by German submarines. She was some 200 or 300 yards behind the Baltic, on which I was, when she was hit. I have been in Paris several times. In fact, we are quite near the city. Last night we had an air raid by the Germans, and it is quite a pleasant experience to hear guns booming over your head. Conditions here are quite satisfactory in all respects. The only trouble is that the distance between U. S. and France is too great for satisfactory receipt of mail. Letters are long in between. I should be very much pleased to receive, as your time allows, personal letters from you.

JOSEPH HAAS, Jr.

Somewhere in France, March 9, 1918.

Sergeant Haas before he joined the forces of Uncle Sam was foreman plater for Stanley & Patterson, of New York, and a teacher in electro-plating chemistry for the New York Branch of the American Electroplaters' Society. He is now attached to the Medical Department Repair Shop, No. 1, Somewhere in France. We begin the publication this month of a series of articles on "Chemistry for Electro-platers," which were written by the sergeant before he left the United States. In this way Sergeant Haas continues to teach his fellow-platers while he does his part in the great war.

THE METAL INDUSTRY will be pleased to receive and publish letters from others of the metal trades who are in the service.—Ed.

FACTORY PRODUCTION COST

To the Editor of THE METAL INDUSTRY:

I have read with interest the article in the February issue of THE METAL INDUSTRY by Mr. Vance on "Factory Production Cost" but there is one point on which I would be glad to have further information either from you or from Mr. Vance. On page 78, the fourth and third to last paragraphs of the article, Mr. Vance states that the distributing of departmental expense should be on the basis of hours instead of percentage of direct labor. His method is to take the total departmental expense and the total number of hours, obtaining thereby an hourly rate.

It seems to me this would be all right if every article going through the department occupied the complete attention of the department for the period. We have, however, here, one department with probably 25 machines and there would be eight or ten orders dovetailing in and going through the department at all times. As Mr. Vance has only one hourly rate, if this were applied to each order the expense would be used up just as many times too much as there were orders running through.

Possibly Mr. Vance meant that the hourly rate would be divided again into the regular machine hour rate so that in ascertaining the expense for any order it would only be necessary to add up the number of hours on the different machines, multiplying by the machine hour rate. This machine hour rate is, however, the one generally known to cost accountants and I thought possibly Mr. Vance had some later method or idea.

J. A. LILLIE, Accountant.

Wallaceburg, Ontario, March 21, 1918.

NEW BOOKS

Advertising. By E. H. Kastor. 6 x 8½ inches. 318 pages including index. 62 illustrations. Bound in Fabricoid. Issued by the La Salle Extension University, Chicago, Ill.

This work is intended primarily for the average busy man having to do with advertising who wants to know more about the various phases of the subject. It contains the kind of practical information which such a person will find helpful and profitable to know.

The expert advertiser may find in it a number of helpful sidelights. Some of the practical details discussed, the expert may find superfluous. They had to be included for that large class of business men who have no practical knowledge of those facts and so find such information exceedingly helpful in planning and placing their advertising.

Steel and Its Heat Treatment.—Second Edition—1918. By Denison K. Bullens. 6¼ x 9¼ inches. 484 pages, 285 illustrations. Bound in boards. Published by John Wiley & Son. Price $4.00. For sale by The Metal Industry.

This work, which is the second edition of the book published in 1917 has been broadened to include additional information of practical nature to illustrate further the application of principles in everyday commercial practice. In the section on heat, additional data is given to illustrate the difference between combustion and the generation of heat and the application of heat to useful work.

The chapter on annealing has also been enlarged with considerable data of interest to the practical man. The number of photo-micrographs and other illustrations has been materially increased to supplement the written matter.

Finding and Stopping Waste in the Modern Boiler Rooms. —By Engineers of the Harrison Safety Boiler Works, Philadelphia, Pa. Bound in cloth. 9 by 7 inches. 276 pages, 213 illustrations. Price $1.00.

This book is a compilation of recent authoritative information on the design, management and operation of steam boiler plants, and contains extremely valuable matter to aid the owner, manager and boiler room operator in securing and maintaining plant economy.

As there are over a hundred thousand steam boiler plants in the United States, with over twenty thousand of considerable size in connection with power plants, and as these plants are estimated to be wasting from ten to twenty-five per cent. of their fuel through the use of improper methods and apparatus, it is believed that there is considerable demand for a book of this kind, consequently the Harrison Safety Boiler Works have decided to put it upon the market at $1 each.

The Journal of the Institute of Metals. Vol. XVIII. Edited by G. Shaw Scott, M. Sc. (Published by The Institute of Metals, 36 Victoria street, London, S. W., England. Price $5.00.

There is continued in the present volume the invaluable discussion on metal melting that was inaugurated by the Institute last year. A new system of gas-firing is described which is claimed to enable metals to be melted exceedingly economically and which effects great savings in coal. The possibilities of using powdered coal for brass melting are fully discussed by numerous fuel experts.

Though brass is so important for war work and so much space is devoted to its consideration in the Journal—notably in the case of Dr. Parker Haigh's article "Experiments on the Fatigue of Brasses"—other of the non-ferrous metals and alloys that the Institute of Metals exists to study receive attention. Thus we find Professor H. C. H. Carpenter, who is to be this year's President of the Institute, contributing a valuable paper, jointly with Lieut. L. Taverner, on the effects of heat on aluminum sheet. Other metallurgical problems discussed relate to high temperature thermostats, the effect of hydrostatic pressure on metals, and etching re-agents. A valuable treatise is given by Professor T. Turner, M. Sc. on "Hardness and Hardening" in which the latest views upon this subject—so important in many a munitions factory—are ably summarized and discussed.

Engineers will be specially interested in Professor W. E. Dalby's full and completely illustrated account of the researches that he has made with the aid of his remarkable "autographic load-extension optical indicator."

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS: JESSE L. JONES, Metallurgical PETER W. BLAIR, Mechanical CHARLES H. PROCTOR, Plating-Chemical

ALLOYING

Q.—In the manufacture of manganese bronze we have been using the process whereby the iron and ferro-manganese have been melted separately and poured into the copper at the time of manufacture. Some other people have been getting good results by melting the iron right in with the copper. We have tried this in a number of cases, but have not met with any great amount of success. Possibly there is some little kink in it that we do not understand.

A.—In order to secure uniform and satisfactory results in alloying iron with copper it is necessary to have your melting conditions uniform. Always use a crucible of the same size and heat the copper to a maximum temperature. This can be kept uniform by measuring with an optical pyrometer. The iron should be pure, in small pieces and each piece should be of as nearly identical weight as possible. Norway iron tacks, scattered a few at a time over the surface of the molten copper, has given good results as a method of introducing iron into copper. Small discs cut from tinned sheet iron and introduced in a similar way, are preferred by some melters. Terne plate or lead-coated sheet iron should be avoided, as the aluminum that is subsequently added is antagonistic to lead.—J. L. J. Problem 2,557.

CASTING

Q.—We have been having some trouble lately with Admiralty gun-metal, the physical properties coming out below the standard requirements, and some of the test bars showing distinct signs of segregation. The mechanical results being unsatisfactory, we have had one of the test bars analysed, and find that there was ¾ per cent. of lead, which exceeds the permissible amount by 50 per cent. Do you think that this would materially lower the breaking point and cause segregation?

A.—You do not give any test results, nor the specification details. There is no reason why ¾ per cent. lead should make so serious a difference to the mechanical properties, assuming that test bars are not very large. The percentage elongation would be from 3 to 5 per cent. lower than that of a lead-free alloy, even if there were no segregation, and the maximum stress would be little affected. Your trouble may be due to oxide. Add 1 pound phosphor copper (10 per cent. phosphorus) to the alloy, and stir well in before pouring. We do not think that segregation of lead is the cause of the low results, although care should be taken to keep lead below 0.5 per cent.—W. T. F. Problem No. 2,558a.

Q.—We shall be glad if you will give us a formula for an acid-resisting alloy for pyrometer sheaths to stand a temperature of 1,200 degrees C.

A.—For such a high temperature porcelain or fused silicon sheaths should be used. These would resist all attack by acid. Iron sheaths are often used to protect the fragile porcelain or silica. No non-ferrous metal or alloy would stand such high temperature.—W. F. T. Problem 2,558.

FINISHING

Q.—How can we obtain a purplish-blue finish on steel by the dip method?

A.—There are two methods of producing a purplish-blue finish on steel by the dip or immersion method. One is termed the heat blue and the other the chemical blue.

The articles to be finished must be clean and bright for both processes. When the heat method is used the articles should always be immersed dry.

HEAT METHOD.

In an iron pot heat 3 parts of sodium nitrate and 1 part of sodium nitrite to 500 degrees Fahr. Immerse the cleansed parts in the molten mixture by the aid of perforated ladles or iron wire baskets. Shake well for a few moments until uniformly colored, then cool in water and dry out by the aid of boiling water and maple sawdust.

CHEMICAL METHOD.

Water	1 gallon
Sodium hyposulphite	4 ounces
Lead acetate	3 ounces

Heat the solution to the boiling point and immerse the articles until uniformly colored. This solution produces a variety of colors, from brown to black, and to produce uniform results each immersion must be carefully timed.

The same methods of cleaning and drying should be followed as are used in the heat treatment. To protect the color obtained from the chemical solution the articles should be coated with lacquer or a heated mixture of paraffin oil and paraffin wax—about 3 parts of the oil to one of the wax. It is not necessary to coat the heat blue, but the wax and oil adds a further protection against rusting.—C. H. P. Problem 2,559.

MELTING

Q.—In making gun-metal ingots we experience great trouble with aluminum. Very often a charge of 12-15 cwt. is completely spoiled: the ingots instead of being rough on the "top" are smooth, and the "back" of the ingots are completely grey-white in color. We shall be pleased to learn if you know of any flux which would destroy the aluminum.

A.—The presence of aluminum in gun-metal is highly detrimental, the mechanical properties being seriously impaired. There is no remedy short of melting the contaminated ingots in a reverberatory furnace and rabbling the molten bath until the aluminum is all oxidized and rises to the surface as a pulverulent powder of alumina. The cautious addition of nitre would hasten the oxidation, and cryolite would help to slag off the dross. Test ingots should be taken from time to time until the appearance of the metal has become normal. Some tin will be lost, and zinc also, if present.—W. T. F. Problem 2,560.

Q.—We are making some bell-shaped castings 4 inches in diameter, about 4 inches deep, weighing 5 pounds and with an oil sand core. We are melting with crucibles which are charged with the following composition:

Copper	63	pounds
Zinc	34	"
Lead	2½	"
Tin	½	"

To keep down the loss on the zinc which is put in after the copper is melted we are covering the metal with charcoal, the latter being skimmed off as clean as possible just before pouring. However, we are having quite a few air holes and charcoal deposits through the castings which make them defective on machining.

A.—We fail to see any good reason why charcoal should enter the mold. What little remains after skimming could be removed by the use of the bellows or air blast or prevented from entering the mold by a skim gate. It is possible that what you consider charcoal may be iron oxide and every care should be used to keep iron out of the mixture.

We have found that the mixture you mention is rather sluggish and that it is necessary to skim dry molds in order to obtain clean castings from it. The substitution of the following mixture is suggested:

Copper	76
Tin	3
Lead	3
Zinc	18

It is assumed that you are using a good open sand, melting quickly and pouring at a fair temperature. With these precautions the mixture last mentioned should give good castings even in green sand molds, undried.—J. L. J. Problem 2,561.

MIXING

Q.—Kindly give me the proper mixture for making electric motor bearings.

A.—The alloy which should prove suitable for your purpose is as follows:—

Copper	87	parts.
Zinc	3	"
Tin	7	"
Lead	3	"

—W. T. F. Problem 2,562.

PLATING

Q.—Could you give me a formula for a silver electro plate that will stand the fusibility of hard enamel on copper? Also, is there one for gold plate along the same lines? That is, would like to plate copper with gold or silver so as to be able to have a fine gold surface, also a fine silver surface on which hard transparent enamel can be applied.

A.—In hard enameling upon copper it must be remembered that copper deposits silver and gold from their solutions by simple immersion; therefore, for solid deposits of these metals suitable for enameling the deposits must be perfectly adherent. If a deposit is obtained by simple immersion as soon as the copper parts are placed in the solution, then, when the current is applied, nine times out of ten the electro deposit will not adhere tenaciously to the deposit by simple immersion.

To avoid the deposit by simple immersion, the copper articles should be slightly amalgamated in a dilute solution of cyanide of mercury.

No set rules for formulas for your purpose can be given, but the solution for silver plating should consist of not less than 4 ounces of metal per gallon, using as little free cyanide as possible. The following formula might give excellent results:

Water	1	gallon
Sodium cyanide	6½	ounces
Silver cyanide	5	ounces
Ammonium chloride	⅓	ounce
Voltage, ½ to 1.	Normal temperature.	

The gold solution should be fairly rich in metal, and the well-known gold Trisalyt would prove to be an excellent material for use in a gold solution. It combines in a chemical combination sodium cyanide, gold cyanide and sodium sulphite.

The following formula will give excellent results:

Water	1 gallon
Gold Trisalyt	¼ ounce
Sodium cyanide	¼ ounce
Sodium phosphate	½ ounce
Temperature, 160° Fahr.	2 to 2½ volts.

If you use a solution prepared according to your own ideas, the gold should be converted to a fulminate and should approximate not less than ¼ ounce Troy of pure gold per gallon of solution. Avoid an excess of cyanide.

A very frequent trouble experienced in plating hard enameled products, that is, after the enamel has been applied, is due to cracking of the enamel. This cracking is due to the natural law of expansion and contraction. The copper readily expands and the vitrous enamel remains normal.

In gold plating, hot solutions are used and the articles to be plated are cleansed and finally washed in cold water which, in the winter-time, is below 40 degrees Fahr. The rapid expansion of the copper from 40 to 180 degrees Fahr. causes the cracking of the glass; the copper endeavors to carry the enamel along in its expansion, but fails, resulting in the fractures as noted. Wash water should be tempered from 40 to 80 and 120 to 160. The slow expansion would avoid the difficulties. After plating, the reverse action should take place and the articles should be finally dried in denatured alcohol.—C. H. P. Problem 2,563.

REFINING

Q.—We should be pleased if you could inform us of the most economical method for extracting lead from lead ashes and lead skimmings.

A.—If the quantities are large they should be treated in a special reverberatory furnace, used for the purpose. The hearth may be 10 feet by 5 feet by 9 inches deep, built of fire-brick, and wholly enclosed in 5-16th inch mild steel plate. Cast-iron plates could be used, supported by buckstaves and tee-rods. There will be an incline of 3 inches from bridge to flue, where the main working door is placed. A tap hole below the flue will allow the lead to discharge into a small kettle separately heated by a fire place underneath. The hearth of the furnace, when heated to dark-red, is covered with a 2-inch layer of fine coal to protect it from the chemical action of the skimmings. It is then filled with skimmings mixed with 10 per cent fine coal. The lead is reduced, flows into the sump or depression near the tap-hole, and is thence tapped at intervals into the kettle. The temperature must be raised toward the end of the operation and the charge rabbled to extract all reduced lead. Four tons of skimmings may be worked in twelve hours, two men working the charge and firing.

If small quantities only are to be treated, they may be worked on the lines as above indicated, using a kettle or a crucible (fluxing off silicious material with lime and soda ash in the latter case). If a kettle be used, the skimmings should be well poled with a pole of hard wood, the dross being skimmed off after extraction of the lead, the latter being ladled out into ingot moulds.—W. F. F. Problem 2,564.

ROLLING

Q.—Can you tell us where we can obtain general information regarding sheet metals that are subject to little or no metallic fatigue, also as to people who manufacture same?

A.—In a general way, metallic fatigue in sheet metal may be said to be due to excessive reductions in the process of rolling. The exterior fibers are compressed beyond their elastic limit, and the unequal stresses thus set up in the material often result in its cracking. This condition is not uncommon in metals that have been cold rolled or cold drawn.

To avoid trouble of this nature, the use of very pure metals is desirable. Pure electrolytic copper and pure electrolytic zinc are ideal materials for making sheet brass that will be free from metallic fatigue. With this purity of materials must also go proper melting, alloying, heating and rolling. The use of the electric furnace for melting is desirable, as there are no products of combustion of the fuel present in it and close regulation of the temperature is possible.

Annealing in oil at 450 degrees Fahr. will often relieve the internal stresses present in cold-rolled metals and prevent the cracking that would otherwise occur.—J. L. J. Problem 2,565.

SOLDERING

Q.—We have been making a brass of the following composition: copper 60 per cent., zinc 38 per cent., lead 2 per cent. aluminum a trace, and are having difficulty in tinning it so that the babbitt will stick to it in making bearings. The babbitt contains: tin 82, antimony 13, and copper 5.

A.—The trouble that you are having with this mixture is also experienced with manganese bronze. It is due to the solution of some of the zinc of the brass in the solder used for tinning. A very small amount of zinc renders solder drossy and non-adherent. Hence in soldering high zinc alloys, if a strong joint is wanted, the temperature of the solder must be kept low, say about 700 degrees Fahr. Pot soldering is to be preferred, because, when a blow torch or other means of heating are used, excessive local overheating is likely.

The babbitting should preferably immediately follow the tinning. If a tinned bearing is allowed to stand around any length of time it acquires an oxidized or greasy coating to which babbitt will not adhere. The tinned surface is also preferably heated to about the melting point of the solder before the babbitt is poured. Heating over a smoky flame will prevent the adherence of the habbitt.

Freedom from arsenic is desirable in your babbitt, as the presence of any considerable amount of arsenic is said to be a cause of the non-adherence of the babbitt to the shell.—J. L. J. Problem 2,566.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,256,954. February 19, 1918. **Process of Metal-Plating Aluminum.** W. J. Travers, Buffalo, N. Y.

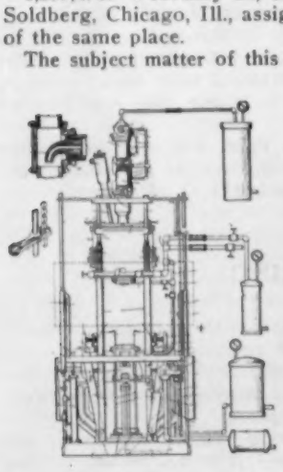
This invention relates to a process of metal-plating aluminum, and has reference more particularly to electro-plating and the subsequent treatment therefor whereby a perfect adherence is obtained between the aluminum object and the metal film deposited thereon.

The aluminum object to be metal plated according to my method or process is first cleaned, preferably electrolytically, as such a cleaning adapts itself better to electroplating, particularly when it is desirable to attain a high polish in the finished article. The aluminum to be plated is made cathode in alkaline solution, which is preferably a hot solution of bicarbonate of soda and carbonate of soda containing about six ounces of bicarbonate of soda and three ounces of carbonate of soda to a gallon of water; then the aluminum object is made cathode in an acid solution, which is preferably a hot solution of oxalic acid containing about eight ounces of acid to a gallon of water. In other words, the aluminum is successively made a cathode in an alkaline bath and then in an acid bath. The object is preferably rinsed in cold water when it is transferred from the alkaline bath to the acid bath, and also when it is transferred from the acid bath to the electrolyte to be electro-plated. The aluminum object may also be electrolytically cleaned by making it successively an anode and a cathode in a metallic salt solution., e. g., sodium nitrate.

The final heat treatment consists in subjecting the article to a gradually increasing temperature uniformly applied to the object. When commercial aluminum sheets are plated, and it is not desired to have the aluminum annealed, the temperature should not exceed 240 degrees centigrade.

1,257,478. February 26, 1918. **Die-Casting Machine.** J. S. Soldberg, Chicago, Ill., assignor to Alemite Metals Company, of the same place.

The subject matter of this invention is a die casting machine.



Die castings, as is well known, are formed by squirting liquid metal into a mold under pressure. The mold is usually in the form of a number of separable dies clamped together during pouring and opened up to strip the casting.

Briefly stated, the chief object of the present invention is to provide a die casting machine as shown in cut, which will produce high grade castings expeditiously and safely.

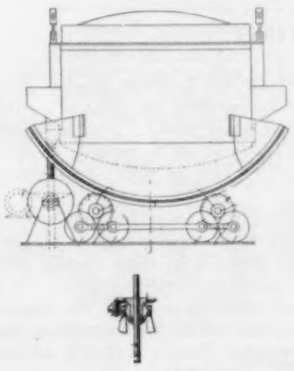
It is also an object of this invention to provide a structure which will be automatic in action, thereby performing the various operations uniformly and in proper sequence.

In accordance with the invention, the melting pot is not subjected to pressure at all, and performs only the function of holding and heating the metal for the castings. A smaller chamber, which will hold only a relatively small quantity of metal sufficient in each case to form a casting, is filled from the melting pot for each operation. The hot metal in the chamber, which is termed the "pouring pot" is discharged under pressure into the mold, while connection with the melting pot is cut off. Thereafter the connection between the pouring pot and the mold is shut off, and the pouring pot is filled from the melting pot and the operations are repeated.

The various parts are operated by compressed air and are automatic in their action. Each operation must be completed before the succeeding one can be performed. This insures uniform and correct action, and, consequently, safe and rapid production of castings.

1,257,879. February 26, 1918. **Tilting Furnace or the Like.** H. J. Kitchen, Luton, England.

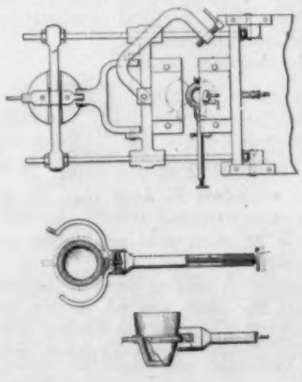
The invention relates to tilting furnaces, ladles or other receptacles from which molten metal, slag or the like is poured, and to means for supporting the recepticle in such a manner that, when tilted in order to discharge the contents, the latter pours from the lip or spout in a direction which is practically constant during the discharge and consequently obviates the necessity for any displacement of the vessel which receives the contents.



For this purpose, according to the invention, the furnace bed or other receptacle containing the molten metal is supported, as shown in cut, on friction rollers engaging with wheels running on suitably disposed rails, the wheels and rollers being so proportioned that as either spout, if there is more than one provided, is moved in one direction by the tilting of the receptacle to which it is attached, it is moved in the opposite direction by the supporting wheels through the same horizontal distance.

1,257,885. February 26, 1918. **Casting Apparatus.** John Kralund, Brooklyn, N. Y. Assignor to Doehler Die Casting Company of the same place.

This invention relates to casting apparatus and more particularly to improvements in the type of pressure die casting apparatus described in Letters Patent No. 973,483 of October 25, 1910, to adapt said apparatus to the practice of the method or art invented by H. H. Doehler, application for Letters Patent upon which is filed simultaneously herewith.



The invention consists primarily in a casting apparatus, as shown in cut, embodying therein a sectional mold, a head forming a pressure chamber surmounting said mold and adapted to be opened, means forming a constricted passageway between said pressure chamber and the interior of said mold whereby the molten metal will tend to flow by gravity from said chamber to said mold, a melting pot or crucible, a support therefore comprising an operating handle, jaws pivotally mounted therein adapted to encircle and to detachably engage said melting pot or crucible and means whereby said jaws may be opened, the walls of said chamber having therein a bearing adapted to receive said support, and means whereby an elastic fluid under pressure may be introduced to said chamber to follow up the metal through said passageway and force the metal into the mold.

1,257,995. March 5, 1918. **Production of Aluminum.** George Guilini, of Lazzago, near Como, Italy.

This is a process for the reduction of aluminum from its compounds. The patent covers:

The process for the production of aluminum which consists in heating aluminium oxid with carbon to a high temp-

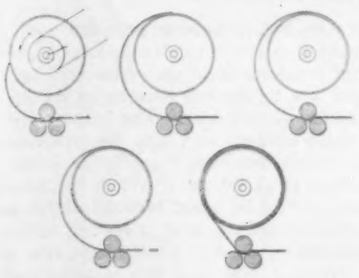
erature and creating and maintaining a vacuum in the furnace.

The process for the production of aluminium which consists in heating aluminium oxid with carbon to a high temperature below the melting point of the aluminium oxid and creating and maintaining a vacuum in the furnace.

The process for the production of aluminum which consists in heating aluminum oxid with carbon to a high temperature below the melting point of the aluminum oxid and above the volatilizing point of aluminum while creating and maintaining a vacuum in the furnace.

1,258,091. March 5, 1918. **Method of Blocking Strip Metal.** Walter R. Clark, of Bridgeport, Connecticut, assignor to Bridgeport Brass Company, of Bridgeport, Connecticut, a corporation of Connecticut.

The primary object of the present invention, therefore, is to provide a simple, efficient method of coiling a strip or other length of stock issuing from a rolling mill or other machine, on a winding drum or block in a safe and expeditious manner.

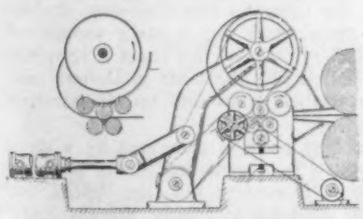


The apparatus comprises a drum, reel or block of any suitable form as shown in cut, together with a new appropriate means for driving such drum or block.

In carrying out the invention the blocking operation is effected by bending the forward end portion of the strip in a certain way around the block so as to form a curve which has a certain relation to the diameter of the block. Moreover, the block is driven at a certain definite speed relative to the normal feed of the stock. More specifically, the forward end portion of the strip is formed into a curve or coil which is normally of less radius than the block, and the block is located within this curve or coil in such a manner as to open it up slightly when the forward extremity of the strip strikes or contacts with the block, thereby causing the forward end of the strip to hug the periphery of the block quite closely and to move around with the rotating block to lay successive convolutions or layers on the block as the rotation of the block continues.

1,258,092. March 5, 1918. **Metal-Coiling Apparatus.** Walter R. Clark, of Bridgeport, Connecticut, assignor to Bridgeport Brass Company, of Bridgeport, Connecticut, a corporation of Connecticut.

One of the objects of the present invention is to meet the above described conditions by providing a machine, as shown in cut, which can be used at will either for coiling the stock without the use of a block or with the use of a block. Viewed in one light the object is to provide any preferred form of coiler for coiling the strip without the use of a block, with means for converting it into a so-called blocker, having provision for winding the strip on a block, drum or reel. Viewed in another aspect the object is to furnish a blocker of such construction that it can, if desired, be employed as a means for forming an open coil devoid of tension, e. g. as an ordinary three-roll coiler.



Another object of the invention is to improve the general construction and operation of apparatus of the class to which the invention relates.

1,258,261. March 5, 1918. **Production of Magnesium.** George O. Seward, of Jersey City, N. J., assignor to American Magnesium Corporation, a corporation of New York.

The present invention relates to an improvement upon the process of producing magnesium and consists primarily in substituting tin or copper for the aluminum usually employed as the cathode in the production of the magnesium alloy, and subsequently "plating out" the magnesium from the resultant magnesium-tin or magnesium-copper alloy.

In carrying the invention into practice, a suitable molten electrolyte, such as magnesium chloride and potassium chloride ($MgCl_2$:2KCl), may be employed, the electrolyte being subjected to the action of a continuous electric current, and with the employment of carbon anodes and a cathode of molten tin or molten copper.

Upon the passage of the current, the magnesium, produced at the molten tin or molten copper cathode, alloys therewith, the resultant alloy becoming richer in magnesium as the electrolysis proceeds. When the magnesium-tin or magnesium-copper alloy thus produced is sufficiently rich in magnesium, it is removed, either in whole or in part, and is used as the anode in the second or plating out step of the process.

1,258,282. March 5, 1918. **Manufacture of Metal Coated Artificial Stones.** Henry Welts, Zuaun, Austria.

This invention relates to the manufacture of metal coated artificial stones and metal coated articles of artificial stone mass, and has for its object to provide a process for producing such stones and articles in a single course of manufacture. The metallic coating produced according to this invention is very compact and the novel process necessitates no application of particular subsidiary means, the metallic coating being produced in connection with the usual shaping of the artificial stones or artificial stone masses.

The novel process consists in impressing the metal in form of a compact surface coating during the shaping of the artificial stones or articles of any kind and from any ground material capable of being hardened to a solid body. Upon the artificial mass, or below the same, just as the manner of pressing requires it, the powdered metal is spread and combines during the pressing action which results in the desired shaping, with the ground mass, as superficial homogeneous laver.

Any metal may be employed, preferably metals that admit of being readily compressed, such as lead, zinc, tin, copper, aluminum, iron, and metal alloys. Of suitable alloys there might be mentioned lead containing a small proportion of tin or antimony, brass, bronze.

1,258,854. March 12, 1918. **Process for Making Aluminum-Sheet-Metal Shapes.** Kurt Barthelmes, Rochester, N. Y.

This invention relates to a new and improved process for shaping articles from sheet aluminum and especially in connection with the manufacture or shaping of sheet metal aluminum spouts for tea or coffee pots. In such manufacture a sheet metal tube or blank of the proper dimensions is formed which tube before it can be safely bent and shaped must be adequately heated. Not only must such a tube be first heated, but, if the distortion is to be substantial, it is necessary that there shall be some sort of internal support or backing to prevent injury to the tube during the bending and shaping process. By this process there is provided in one step a heating agent which will also operate as a reinforcing core or backing to internally support the tube so that it may be bent into the desired shape without injury.

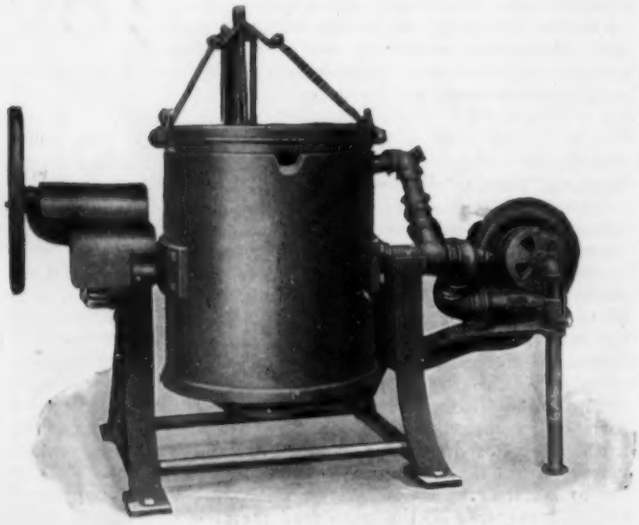
In practising the process, the tube is first filled with molten metal, whereby the heat of said metal will adequately heat the aluminum so that it may later be bent or shaped without danger of breaking. The metal selected for the core should be so relatively soft and workable that, after it has cooled, the article may then be operated upon by any suitable tools or dies to give to the spout the desired shape. When the desired shape is attained the core is melted out. It has been found that lead, or a lead alloy, constitutes a very satisfactory material for the core.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

MONARCH NON-CRUCIBLE TILTING METAL MELTING FURNACE

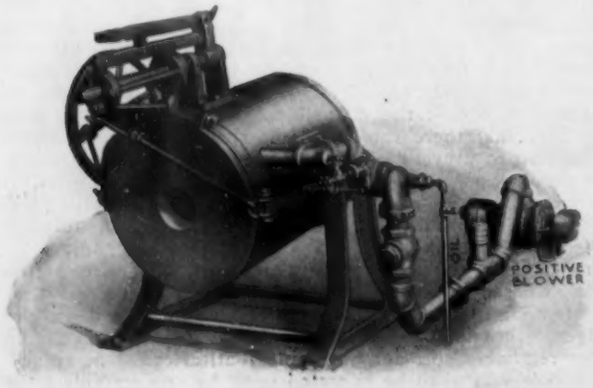
The Monarch Engineering and Manufacturing Company, Baltimore, Md., announces the placing upon the market of a vertical non-crucible tilting metal melting furnace, which has been designed to fill in where a small, quick melt in a non-crucible furnace is desired. One of the chief features of this furnace which will commend it to metal melters is the fact that either gas or



MONARCH VERTICAL NON-CRUCIBLE TILTING FURNACE EQUIPPED WITH PREMIX BURNER FOR GAS FUEL.

oil fuel may be used, each furnace being so arranged that it can be changed over from one fuel to the other with but little time and expense.

The furnace can be equipped with the Maxon Premix* burner for gas burning, as shown in the accompanying illustration. When arranged with a Premix motor blower the furnace can be converted from gas to oil simply by attaching a very small oil pump which is placed on the same bed as the motor and geared to the motor shaft. A ratio valve can be used with the



THE SAME FURNACE EQUIPPED FOR OIL FUEL.

Premix to adjust proper proportions of gas and oil, giving a neutral and oxidizing or reducing flame in any quantity desired.

For burning oil any general system having an air pressure of from 12 to 24 ounces and a flame of approximately 200 cubic feet free air per minute, and oil pressure of ten pounds and up will give ideal results, very high temperatures and perfect control.

*This burner was described in THE METAL INDUSTRY for March, 1918.

CAPACITY OF FURNACE

The melting capacity of the furnace shown in the illustrations is approximately 400 pounds per heat, and the length of time to melt a charge will depend largely upon the metal to be melted, but in round numbers from 40 to 60 minutes should cover the melting period.

CHARGING AND OPERATING

As will be seen from the cut, the furnace is provided with a removable cover, thus making it possible to charge large pieces without the added expense of breaking them up. Also very light scrap may be readily charged due to the full opening of the furnace when the cover is removed to one side. The furnace bottom is rounded, having no sharp corners, and with the removable cover the cleaning of the furnace becomes exceedingly simple.

The operation of this furnace is as follows: When the metal has been charged the furnace should be tilted forward as far as the metal will permit and the furnace allowed to remain in this position for about fifteen minutes; then it is tilted to the rear at the same angle for a like period of time, and this is to be continued until the metal is ready to pour.

As the tilting mechanism is of the worm gear type, perfect safety and precision in pouring are obtained. The furnace sets at an angle desired and cannot tip forward or backward accidentally.

THE COST IN COAL OF AVOIDABLE BELT SLIP

By WM. D. YOUNG, CLING-SURFACE COMPANY, BUFFALO, N. Y.

Avoidable losses are the ones to stop, always, especially if they can be stopped at small expense.

Never before have we understood the strategic and money value of coal as thoroughly as we do now. Never before has it been so necessary for us to save, even though considerable money must be spent in order to effect the saving.

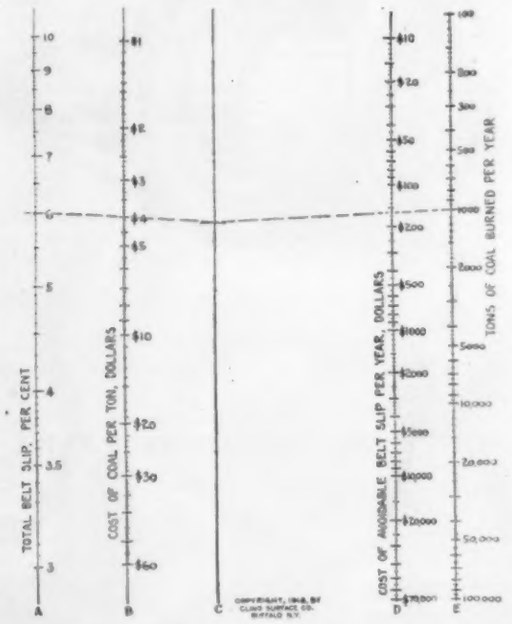
One of the very simplest losses to overcome, however, and at small expense, is belt slip and since belts are used to so great an extent it will pay to look into the matter with more thoroughness than has been given it in the past. To show the extent of the loss of money through slipping of the main belt alone a chart, supplied by the Cling-Surface Company, Buffalo, N. Y., is shown herewith, upon which this is easily ascertained. by glancing up and down column "D" of this chart it is evident that the "Cost of Avoidable Belt Slip per Year in Dollars" may vary all the way from the smallest sums into the thousands of dollars.

Where the power in the first place is generated by a steam engine and is then transmitted to a generator or to the main shaft through a main belt it is evident that the "entire coal pile" passes through that in the form of energy, literally speaking. If the belt slips, which it should not do, a certain portion of the coal pile does not "get through" but is lost into the atmosphere in the form of waste heat. A main belt is merely a "link" connecting the engine with the generator or with the machines themselves. In fact, every belt that transmits power is a connecting link and the efficiency of that link depends largely upon the freedom from slippage and the avoidance of strain on the shafts. Slipless, easy-running belts are most desirable.

Roughly, two per cent. of the potential power in the driving pulley of the engine is represented by "belt creep." Its loss is unavoidable because of the elasticity of the belt. This has been recognized and provided for in the chart, so the reader can go

ahead and connect known values, while the intersection with column "D" gives the avoidable money loss.

Simply zig-zag across the chart twice with a straight-edge, as shown by the dotted lines, and the money loss is immediately found. Thus, if the total belt slip is 6 per cent. (column A) and the cost of coal per ton is $4 (column B), run a straight line through those two points and locate the intersection with column "C." Then from that point of intersection run over to



CLING SURFACE COMPANY'S BELT SLIPPING CHART.

the tons of coal burned per year (which in this instance has been stated as 1,000 tons) and the cost of avoidable belt slip per year is shown by column "D" as being $1.60.

For $160, as the makers say, one can purchase a great deal of Cling-Surface, and one can in consequence well afford to give a little time every month to the care of the belting. Yearly loss due to belt slip is often considerably greater than $160, for it must be remembered that this chart applies only to one belt —the main belt. If all of the distributing or secondary belts slip equally as much the yearly loss is double, triple, or even four times as much as $160.

To give a clear idea as to the meaning of "Total Belt Slip Per Cent." let us take an example. You find by means of a revolution counter that a given driven pulley is rotating only 940 times per minute. You figure that without slip it should rotate 1,000 times per minute. Sixty revolutions per minute, therefore, are absolutely lost. Dividing this 60 by the r. p. m. that pulley SHOULD make you get 0.060 or 6 per cent., which is the "Total Belt Slip." After having made this determination, now, it is a simple matter to apply it to the chart as has been done and determine the money loss per year due to such slip.

Furthermore, belts which do not slip do not require tension and can be run easy or slack—every belt thus relieved of its tension reduces by that much the total plant friction load and this means also a longer-lived belt, cool bearings, less oil used, less time of men and machines lost during repairs and more power at the machines, for friction represents lost power.

NEW TINNING PROCESS

In referring to the methods employed for timing metals by the New Standard Hardware Works of Mount Joy, Pa., Vice-President C. J. Scheimer says: "What we have actually accomplished in the process of tinning is the elimination of the tallow stripping method and the polishing of the pieces in bran, sawdust or flour and also eliminated the wiping process. In other words the majority of concerns who do hot tinning use the old system which requires all the above mentioned extra operations. For instance, in tinning cream separator discs most manufacturers have men who do nothing but wipe off the surplus tin which accumulates on the edges of the pieces. This is not required with our present method. Another man would be required to wipe off the tallow; we have eliminated this. Still another man would be required to polish the pieces in sawdust, bran or flour. We have eliminated this. Then we have arranged for a different method of handling the work and in doing so have increased the output way beyond the point the average tinning plant considered good production. We might mention that some of the concerns with whom we are now figuring for business have spent as high as $250,000 for tinning plants and after doing so found out they did not have an economical running plant. Our Unit System Process insures the purchaser of economical operations, rapid production and is a saver of time, material and labor.

ACIERAL

Some recent tests of acieral, the new strong aluminum metal made at the Bureau of Construction and Repair of the Navy Department, Washington, D. C., give remarkable results. A report of these tests is as follows:

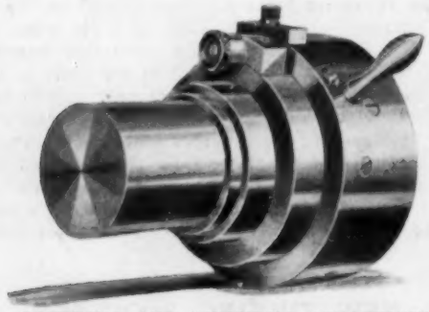
Specimen	Representing Acieral Grade	Original Dimensions Inches	Original Area Sq. In.	Reduction in Area Per cent	Elongation in 2 Inch Per Cent	Proportional Limit Lb. Sq. In.	Ultimate Strength Lb. Sq. In.	Modulus Elasticity Lb. Sq. In.
A1	A	.066 x .755	.0498	6.22	4.6	37,500	51,300	10,870,000
A2	A	.066 x .755	.0498	4.62	2.0	37,000	49,400	10,000,000
B1	B	.064 x .7575	.0561	18.71	4.0	34,000	46,900	8,854,000
B2	B	.064 x .7575	.0561	16.85	3.1	35,000	45,800	8,700,000
C1	C	.065 x .752	.0489	6.81	1.8	51,000	66,400	10,210,000
C2	C	.065 x .752	.0495	7.28	4.1	51,000	67,600	10,640,000
D1	D	.0656 x 7615	.0500	3.8	2.0	52,000	71,800	10,200,000
D2	D	.0656 x .7615	.0500	2.8	2.0	54,000	69,000	10,525,000

(Signed) D. W. TAYLOR,
Chief Constructor, U. S. N. Chief of Bureau.

Acieral metal is manufactured by the Acieral Company of America, 26 Courtland street, New York, with a foundry at 20 Orange street, Newark, N. J. The company issues a little booklet which gives a great deal of information about the new metal.

MODERN DIE HEADS

The Modern Tool Company, Erie, Pa., is now manufacturing in large quantities the Modern self-opening and adjustable screw cutting die head, as shown in the accompanying cuts. This die head is designed for use in the turret of hand or automatic machines and when equipped with a closing device may be used



ROUGHING AND FINISHING ATTACHMENT

on the spindle of a drill press or other revolving spindle machines.

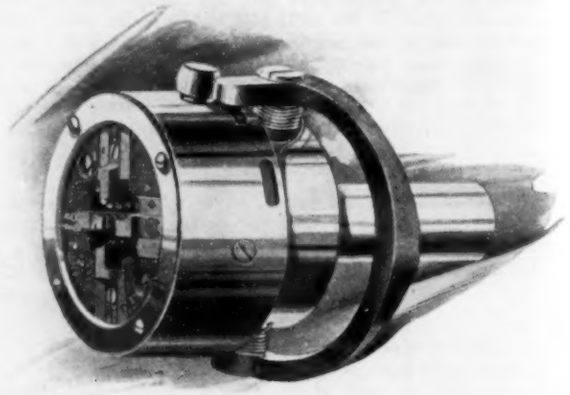
Some of the advantages claimed for these self-opening die heads as enumerated by the manufacturers include the following: Production costs are reduced by eliminating the slow reversal of the machine to back the die off the piece, and spoiled pieces are avoided as the dies do not touch the thread after it has been cut.

SPECIAL TAPER ATTACHMENT

FACE PLATE AND FLOATING ATTACHMENT

The Modern heads are fitted with an improved cleaning device which permits cleaning without taking the head apart, thus eliminating the tendencies of the heads to clog with chips. The Modern die head is also made in a single style which cut all threads, coarse or fine, straight or taper, of standard or special pitch, and pipe threads of any length within the capacity of the die.

The adaptability of the Modern die is not limited to any specific metal and is used with most satisfactory results on brass, bronze, nickel, aluminum, or in fact any metal that can be threaded.



SPECIAL CLOSING ATTACHMENT

WHERE THE THERMOMETER FAILS

The old mercury thermometer, which serves to tell us when it is "ninety" in the shade, has proved so useful in warning against overheat in so many different branches of work, from poultry-hatching to motor-car driving, that one might naturally expect it to be used very extensively in connection with the production of electricity.

The difficulty here, however, is that many parts of the dynamos and motors used in generating and using the world's electrical power are quite inaccessible to thermometers, although frequently subjected to dangerous overheat. To overcome this condition in the larger capacity machines, and also to provide means of warning operators stationed at a distance from their dynamos of the rising heat, the General Electric Company of Schenectady, N. Y., has developed a temperature indicator which is operated by electricity itself.

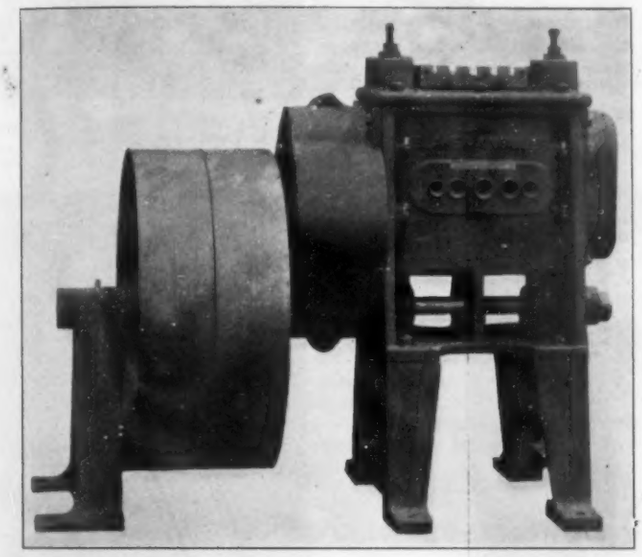
ELECTRICALLY OPERATED TEMPERATURE INDICATOR.

This device consists of "feeler coils," connecting wire, a few small stitches, and a "voltmeter." The feeler coils are placed in the dynamo or motor in parts where overheat is especially feared and are then connected to the "voltmeter" which is really the indicating instrument. When the dynamo "warms up," these coils get warm also and cause the indicating needle of the voltmeter to move over a scale graduated in degrees centigrade, telling the operator just how "hot" the machine is in the part in which the feeler coil is located, which, of course, is the thing he wishes to know. The "voltmeter" or indicator is mounted on a suitable panel which may be located hundreds of feet—or any desired distance—from the generating dynamo. This is one of the reasons why the new device should prove unusually popular in those stations where large and costly electrical machinery is employed.

BLAKE-KNOWLES CLIMAX CORE WIRE STRAIGHTENING MACHINES

An important item in every foundry is the wire used in strengthening cores. This wire, which is bent and twisted into every conceivable shape to conform to various core requirements must either be strengthened so as to be available for future use or thrown into the scrap heap. The expense of straightening the wires by hand is too great to be considered from an operating point of view, so that unless some cheaper means for this work can be employed, the material is practically wasted, and in these days of rising costs, wire shortage and slow deliveries, wastage is a serious matter. The Blake-Knowles Climax Straightener was devised as a solution of the problem, and a long and constantly increasing list of users is an attestation of its remarkable success. It is a very simple and durable machine, as can be seen from the illustrations, and can be easily operated by the most unskilled labor. The bent wire ends are inserted in holes of proper size on the front side of the straightener and are drawn through by means of grooved steel rollers which deliver the wires in suitable shape for use again as core rod stock.

The machines are built in three different sizes, and the range

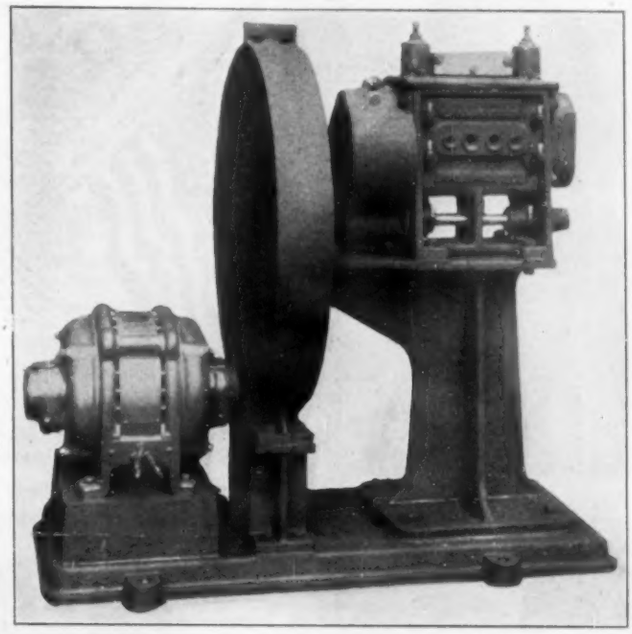


BLAKE-KNOWLES NO. 3 CLIMAX CORE WIRE STRAIGHTENING MACHINE.

of wires that the line will handle is from 1/16" diameter as a minimum for the smallest machine to ¾" diameter as a maximum for the largest machine, and each size straightener can be arranged to take any wire diameter within the limits of its capacity. The machine frames are of cast iron, made in one piece so that construction is very rigid and parts always in alignment. The rolls are made of forged nickel steel, case-carbonized and hardened. They are fitted with forged steel cut gears, one set at each end, and are driven by means of another set of forged steel cut gears which take their motion from the main driving pulley or from an attached electric motor, the machines being adapted for either style of drive. All gearing is completely enclosed in suitable guards so that accidents from this source are out of the question.

A wire gauge on the machine indicates the proper hole in which wire is to be run, and, in general, the machine is designed to meet the need for simplicity, convenience and durability. The illustration above shows a typical installation of a No. 3 size machine. The pile at the left side of the picture is the average amount of bent wires which is reclaimed from used cores each morning, and, as will be seen, represents a very considerable amount of material. The time occupied by the boy in passing these bent wires through the machine averages four hours. The wires, after this operation, as is plainly shown, are completely straightened and ready for immediate use. In the particular case represented above it was found that the machine used had effected a saving of more than two hundred dollars' worth of core rods in the first three months of its installation.

These core wire straighteners are built by the Blake & Knowles Works of the Worthington Pump & Machinery Corporation,



BLAKE-KNOWLES NO. 2 CORE WIRE STRAIGHTENER WITH MOTOR DRIVE.

whose main office is located at 115 Broadway, New York. Branch offices are established in all the principal cities of the United States.

A BOOK FOR PLATERS

There has been considerable time spent by the platers of the various branches to discover a work on chemistry that would be sufficiently fundamental to be understood by men who had had no previous training on the subject and at the same time which might be sufficiently abstract to be of value to a man who had at least made a start in the study of chemical reactions.

It looks as though the selection made by the Rochester Branch of the American Electro Platers' Society of the work "Foundations of Chemistry," by Messrs. Blanchard and Wade, just about answers the description. In this work the authors have striven to write a book, the intelligent study of which will develop both the power of the pupil to think originally and his appreciation of the relation between the subject matter of chemistry and his daily life.

In illustrating the principles of chemistry, very many important industrial processes and applications to daily life have been chosen, but the greatest effort has been made to keep the idea uppermost that the principles concerned are of universal application.

At the end of the various chapters of the book there are given problems which are graded in difficulty and some are designed to tax the thinking power of the brightest student, for it is true that a course in science to be of the greatest value must inspire the pupil to think.

The book is 5 x 7½ inches in size, contains 446 pages, including an appendix and index, has 75 illustrations and is made up of 33 chapters. Taking it all in all, it is a book which every plater or workman interested in the finishing of metals should be possessed of. For sale by THE METAL INDUSTRY. Price, $1.25.

BUY LIBERTY BONDS

METAL MEN IN THE SERVICE OF THE ALLIES—SERIES 4

LIEUT. PERCY ARMSTRONG,
Ordnance Dept.

THE HONOR PAGE

The Metal Industry invites anyone connected with the metal trades who is in or has friends in the service to send in photograph and story of career.

LIEUT. CLARENCE McKAY,
Ordnance Dept.

CORP. FRANK TISHKINAS,
Co. G, 304th U. S. Infantry.

JOHN J. WALL,
U. S. S. Connecticut.

PRIVATE GEORGE A. STOUTENBURG,
Troop H, 3rd U. S. Cavalry.

CHARLES BROWNE,
12th Field Artillery.

HUGH W. MELLON,
102d U. S. Infantry.

WILLIAM RUSSELL,
Chief Machinist Mate, U. S. Navy.

BOYS IN THE SERVICE FROM THE SCOVILL MANUFACTURING COMPANY, WATERBURY, CONN.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN FOUNDRYMEN'S ASSOCIATION

A. O. Backert, secretary, has issued under date of March 29, 1918, a financial statement of the Boston exhibition of foundry supplies and equipment held in that city during the week of September 24, 1917. The statement contains the following:

The total receipts from the sale of space amounted to $23,450; exhibition permits, $3,900, and gate receipts, $1,643; making a total income direct from the exhibition of $28,993. From the Boston Chamber of Commerce and the City of Boston, the sum of $5,000 was received to defray the rental of the exhibition building and to cover other incidental building repair expenses. Including the interest on bank balances the total income was $34,131.60.

At the time when the books were audited by Ernst & Ernst, all of the bills directly chargeable against the Boston exhibition were not available, and while the statement showed expenditures of $28,905.47 up to December 24, accounts paid since that date aggregate $1,845.47. The total outlay, therefore, was $30,750.94 and the net profits, $3,380.66, instead of $5,226.13, as shown by the auditors' statement.

In a report presented at a meeting of the board of directors of the Association, held at Pittsburgh, Saturday, February 16, 1918, C. E. Hoyt, exhibition manager, presented a report of the number of exhibitors at Boston and the amount of space sold. At Boston there were 155 exhibitors, compared with 146 at Cleveland, a gain of 9. The total space sold at Boston was 43,674 square feet, against 37,930 at Cleveland, an increase of 5,744 square feet.

As was announced in the March issue of THE METAL INDUSTRY:

The 1918 exhibition of foundry supplies and equipment, machine tools and accessories, and the annual convention of the American Foundrymen's Association and the American Institute of Metals, will be held in Milwaukee, Wis., during the week of October 7. All of the activities will be centered in the Milwaukee Auditorium, one of the finest exhibition and convention buildings in the world.

AMERICAN ELECTRO-CHEMICAL SOCIETY

The spring meeting of this society will embrace a trip to the Appalachian South, beginning April 28. The main object of the trip is to bring together the electro-chemical users of power of the north and those who have power developments in the south. The outline of the trip as at present proposed is as follows:

Leaving Washington on the Southern Railway, on Sunday evening, April 28, Kingsport, Tenn., will be visited on Monday. This is perhaps the fastest developing chemical industrial center in the South, and has several industries which will interest electrochemists. Tuesday is to be spent in the Knoxville district, paying particular visits to a zinc concentrating plant, and to the great water-power development of the Aluminum Company of America on the Little Tennessee River. Wednesday, Chattanooga will be visited, with several interesting industries to be seen, a large water-power development to inspect, and the beautiful surroundings of the City to be enjoyed. Thursday will cover the inspection of the great Mussel Shoals water-power development near Sheffield, Ala., where the Government nitrate plant and a cyanamide plant are in process of construction. Friday is devoted to Birmingham, Ala., with its great blast-furnaces, by-product coke-plants, steel mills and other industries. Saturday morning a stop of several hours will be made at Anniston, Ala., to see the electric ferro-manganese plant and steel furnaces. The train then runs through to Washington, arriving there Sunday noon.

Professor Joseph W. Richards, secretary of the society, requests that members who are interested in taking this trip should correspond with C. F. Roth, Grand Central Palace, New York, as soon as possible in order that arrangements for the proper accommodations may be made.

MACHINE TOOL BUILDERS

The spring convention of the National Machine Tool Builders' Association for 1918 will be held Thursday and Friday, May 16 and 17, at the Marlborough-Blenheim Hotel, Atlantic City, N. J., according to an announcement issued by Charles E. Hildreth, Worcester, Mass., general manager of the association.

AMERICAN ELECTRO-PLATERS SOCIETY

Bridgeport Branch—Meets third Friday of each month in its laboratory at 260 John street, Bridgeport, Conn. Royal F. Clark, Box 883, Bridgeport, Conn., secretary.

The March meeting of this branch was held on March 15, with sixteen members present. Nelson A. Barnard gave a talk on the deposition of black nickel and also exhibited some samples of black nickel finish on steel and brass. William Schneider, of the New York Branch, spoke on the making up of aqua ammonia with an apparatus which he said the plater can easily make himself.

The Branch has sent out the following notice:

To the Manufacturer, Superintendent, Chemist and Plater:

The Bridgeport Branch, American Electro-platers' Society extend an invitation to all Factory Owners, Managers and Superintendents who are interested in Electroplating to attend their Fifth Annual Banquet at the Stratfield Hotel, Saturday evening, May 4th, at 7.30 a. m.

Having once become satisfied with the object and aims of this society we believe that every manufacturer that has a plating department connected with his plant will be interested in its development and will encourage his foreman plater to become a member of the society if he is not already one.

Liberty Bonds Save Lives—
the Lives of Our Sons

It is strictly an educational society and its sole object is to aid its members to become more proficient in their work. In order to do this, we have a laboratory at No. 260 John street, where regular meetings are held at which are discussed the various methods, processes, etc., employed in electroplating.

These discussions alone have been a very material help to the members, but going still further, a series of semi-monthly talks among the members relative to electro-chemistry are held in the laboratory.

We trust that one or more of your staff may be able to avail themselves of this opportunity. Tickets can be obtained from any of the members or from Royal F. Clark, Secretary, P. O. Box 671, Bridgeport, Conn., at $2.00 each. Ladies are invited.

Grand Rapids Branch.—A new branch of the American Electro-Platers' Society was formed on March 18, 1918, by the platers of Grand Rapids, Mich. The meeting was called to order by E. Lamoureaux, who introduced Co. J. H. Hansjosten as chairman of the evening. Col. Hansjosten stated the objects of the American Electro-Platers' Society, briefly reviewed its history and pointed out the benefits of membership in it.

It was decided to immediately organize and apply for a charter, and the following men were elected officers of the new branch: William W. Fitzsimmons, president; Frank A. Hollway, vice-president; John C. Knape, secretary-treasurer, and John C. Miller, Willard J. Whitney, and Thomas Pates, board of managers. The new branch starts with a membership of eleven, and at least four prospective members who were unable to be present at the first meeting.

The following names were attached to the petition for a temporary charter: Willard J. Whitney, Matthew Pollie, Charles J. E. Poe, Axel Rickson, John C. Miller, Walter J. Allen, F. B. Hawley, Frank Hollway, William W. Fitzsimons and John C. Knape

Rochester Branch—Meets second and fourth Friday of each month at University of Rochester. Secretary Sylvester Gartland, 128 Bryan Street, Rochester, N. Y.

This branch held its Fifth annual banquet and reunion at the Osburn House, Saturday evening, March 30, 1918.

The menu which the Committee had very carefully selected was very acceptable and satisfactory to all who participated. President, George Hesselink gave a talk on the aims and objects of the Society, and finished up by introducing C. V. Haring as toastmaster who acquitted himself most creditably and introduced Frank Kolb, Chemist at the Bausch & Lomb Optical Company as the Speaker of the evening. Mr. Kolb gave a very forceful talk in regards to the future need of the Electroplater to acquire the knowledge of Electro-chemistry. The toastmaster next introduced Harry Flannagan, sales manager representing the Celluloid Zapon Company, who gave a short talk on good fellowship.

After the speakers had finished, the toastmaster announced that all should remain seated, while a flash-light picture was taken of the members and friends. The next attraction was the exhibit of the work finished by the following electro-platers: C. V. Haring, Ritter Dental Company, Fancy colors in different designs. Eli Beaudry, Bastian Bros., Royal bronze and a wide variety of finishes on badges. Chas. Griffin, Pritchard Strong Stamping Company, Lantern finished in nickel. Adolph Wahl, Metal Art Company, Watch fobs and class pins finished in all colors, gold and silver. Sylvester Gartland, Taylor Instrument Companies, Dials and Scales, oxidized and silvered.

The souvenirs distributed at the banquet were as follows:

FIFTH ANNUAL BANQUET OF ROCHESTER BRANCH OF AMERICAN ELECTRO-PLATERS SOCIETY HELD IN ROCHESTER, N. Y., MARCH 30, 1918.

Paper hats in the shape of Indian wigwams, donated by J. B. Ford Company of Wyandotte, Michigan. Metal etched calendar donated by The Celluloid Zapon Company, New York. Stick pins donated by Dupont Chemical Works, New York City. Badges donated by the Metal Arts Company, Rochester, N. Y.

The Banquet Committee, which consisted of Chas. V. Haring, chairman; Charles Griffen, Adolph Wahl, Sylvester P. Gartland and George Hasselink, deserve a great deal of credit for the carrying out of the program.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

LEON O. HART

At the annual meeting of the stockholders and directors of the Driver-Harris Company, Harrison, N. J., **Leon O. Hart** was elected treasurer and a director of the company.

LEON O. HART.

Mr. Hart was born in Hoboken, N. J., in 1885, and was educated at the Stevens Institute of Technology, where he graduated in 1907 with the degree of mechanical engineer. After graduation, he worked as a cadet engineer with the Public Service Gas Company of New Jersey for about one year.

On October 2, 1908, Mr. Hart became associated with the Driver-Harris Company as electrical engineer, in which capacity he served until March, 1917, when he was elected assistant treasurer.

Mr. Hart is a member of the American Electro Chemical Society, and also the American Society of Electrical Engineers, and is widely known throughout the electrical industries on account of his association with these societies, as well as with the Driver-Harris Company.

H. A. Kramer, representing the Waterbury Manufacturing Company, Waterbury, Conn., has opened an office at No. 310 Engineers Building, Cleveland, Ohio.

H. W. Gunther, representing the Chase Metal Company and the Chase Rolling Mill Company, both of Waterbury, Conn., has opened an office at No. 310 Engineers Building, Cleveland, Ohio.

John A. Sinnott, formerly superintendent of Browns Copper and Brass Rolling Mills, New Toronto, Canada, has become connected with the Cleveland Brass and Copper Company of Cleveland, Ohio, as general superintendent.

James J. Manderscheid, recently a representative of the James H. Rhodes Company of Chicago, Ill., has become connected with the American Platers' Supply Company, manufacturers of platers' and polishers' supplies, 212-214 West Kinzie street, Chicago, Ill., in the capacity of sales manager.

Franklin W. Hobbs, for over twenty years foreman plater with the Wood & Bishop Company, of Bangor, Me., has severed his connections with that firm and has become connected with the Crogan Manufacturing Company of the same city as superintendent of their electro-plating and metal finishing department. The Crogan Company are manufacturers of saws and steel tapes.

Benjaman S. Rosenberg, for a number of years connected with the Eagle Smelting & Refining Works, Nassau Smelting & Refining Works and Post van der Burg & Company of New York, has been appointed manager of the New York office of the United Smelting and Aluminum Company, New Haven, Conn., to take the place of C. J. Wolfe, who recently resigned as manager of that office.

DEATH

ELISHA J. STEELE

The death of Elisha J. Steele, for many years vice president of the Coe branch of the American Brass Company, occurred at his home in Torrington, Conn., on Sunday, March 10, after an illness of only a few hours.

ELISHA J. STEELE.

The funeral was held at 2:30 o'clock the following Wednesday afternoon. A memorial service was held at the Alhambra theatre on Sunday, March 17, in which many patriotic and religious organizations participated. Mr. Steele is survived by two daughters, Mrs. Harry A. Hall and Mrs. Arthur F. Tuttle, both of Torrington; a sister, Mrs. Abbie A. Fyler; a brother, George B. Steele, of Buffalo, N. Y.; a niece, Mrs. A. W. Avery, of New Haven; and three grand-children, Elizabeth, Elisha and Martha Tuttle, children of Mrs. Arthur F. Tuttle. Mr. Steele had one son, who died of typhoid fever contracted during the civil war.

Mr. Steele retired from business last year. For 41 years he was connected with the Coe branch and in October, 1916, resigned from the vice presidency. On his return from the Civil War, Mr. Steele secured a position with the firm of Turner & Clark and there remained until 1875, when he was appointed a superintendent of the brass department of the Coe branch. Four years later he was made superintendent of the wire and rod department and in 1889 he was given additional responsibility in starting and directing the brazed and seamless tube department. Some years later, when the Coe branch was merged with the American Brass Company, Mr. Steele still remained superintendent of the wire, rod and tube mills and later became assistant secretary, secretary and treasurer, treasurer, and in 1913 became vice president of the Coe branch. His activities were uninterrupted until his resignation was handed in.

On the 8th of February, 1917, Mr. Steele was honored as no other official of the company had ever been, by a reception and banquet at which about 150 officers, superintendents and foremen of the American Brass Company were present. It was made an occasion never to be forgotten by those who participated. With John A. Coe, Jr., vice president of the American Brass Company, as toastmaster, Charles F. Brooker, the president of the company, was called upon and presented in behalf of his associates an engrossed book of testimonials and a bronze Chelsea clock. At the time of his death, Mr. Steele was a director of the Torrington Water Company and the Torrington Printing Company.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

BRIDGEPORT, CONN.

APRIL 8, 1918.

With the coming of summer the industrial forces of Bridgeport are to be greatly augmented. Work has been rushed along all during the past winter at top speed, but there are several factories in the city which plan to increase their output in the very near future. The Remington Arms Company plans to hire between 8,000 and 10,000 men during the first week or two of April, the purpose being to increase the output of the Browning guns for the United States Government. Although the company has been engaged in the manufacture of these guns for some time, and will ship the first lot of them this week, their manufacture in the plant is to be greatly increased. An official in high standing at the Arms plant is authority for the statement that within a week or two the Arms plant will have more men on its payroll than it has ever had since its beginning.

Labor trouble visited the plant of the Liberty Ordnance Company a short time ago, brought on by the refusal of one of the men to work overtime and his consequent discharge. Quite a number of his fellow employees in all kinds of positions walked out of the shop the following morning. The trouble was also due partly to a refusal of the officials of the company to grant a 10-cent-an-hour increase to certain classes of employees. The trouble has, however, been settled, at least temporarily, and the men are again back at their work.

Bridgeport's old bugaboo, the housing question, is very liable to resume formidable proportions again this summer because of the great number of additional men and their families expected here before the warm weather. Apartments are at a premium even at the present time, and in spite of the activities of the Housing Company, which is erecting individual houses and apartments as fast as possible, the incoming flow of workers is far exceeding the supply of accommodations.

As, however, over 80 per cent. of the factories in the city are doing Government work, either directly or indirectly, it is very probable that Government aid will be forthcoming on the housing question, but whether this aid will arrive in time or not is a question.

The leading metal factories of the city at the present time seem to be preserving a temporary silence as regards the prospects for the coming summer. Some time ago all of them stated that the outlook for the coming season was very bright. All of them claimed large orders which would keep them busy until at least late in the fall and all predicted a very prosperous year.

Now, however, although they still state that things are going satisfactorily, there seems to be an undercurrent of uneasiness among some of the manufacturers. What this uneasiness results from is hard to determine, as all the officials of the various factories admit that they still have plenty of work to do, in many cases as much or a little more than they can handle. The only solution of this problem seen at present is in the labor condition, not only in this city but prevailing to a certain extent in other parts of New England.

Labor has never been as valuable as it is at the present time, and probably it has also never been so independent. Men keep shifting from one job to another with but short stays at each factory. The result being that by the time a man is broken in to his job and made of some value to his concern he leaves, either because of better wage inducements or better living or working conditions.

The war, and its natural call on workmen of all classes, also seems to be causing some uneasiness among the local manufacturers. Already many of them are supplying the places of drafted and enlisted men with girls and women, and most of them are already making plans to introduce female labor in their plants in the near future. Due to the consequent lowering of wages following from this, there is a strong probability that Bridgeport may be the scene of some more labor trouble during the latter part of the summer and early fall—L. M. P.

Money Means Munitions—Buy Liberty Bonds

NEW BRITAIN, CONN.

April 8, 1918.

Today there is hardly a factory in New Britain, however great or small it may be, that is not actively engaged in the manufacturing of war munitions for the United States government or its Allies. From the vast buildings of the American Hardware corporation to the smaller foundry of the Vulcan Iron Works, this work is going on. Even the small factory conducted by Edward B. Alling, an expert metal pattern maker and experimenter, is actively engaged in doing work for Uncle Sam. Although since the Great War first began almost four years ago there has been war work going on in this city, it has not been until the last few months that it has expanded to any considerable extent, but despite the fact that every local concern seems to be getting its share it is evident that the high water mark of the war munitions business in New Britain has not been reached as yet. In view of these conditions it is needless to state that business conditions are good, that labor conditions are good and there seems to be no reason to believe that there will not be plenty of work here for many months to come.

It was the North & Judd Manufacturing Company that first felt the effect of the stimulated war industries about four years ago and as long ago as the time of the sinking of the Lusitania this plant was turning out enormous quantities of buckles, snaps and harness trappings for England, some of which went down on that ill-fated ship. Later this work

Lend Him a Hand—Buy Liberty Bonds

expanded so that orders for Uncle Sam were being filled and today it has expanded to an even greater extent and gas masks are also being made here. So great is the government demand for gas masks that no less than five local concerns are engaged in their manufacture. The North & Judd Manufacturing Company is having to employ High School students during Easter vacation to work on parts of the mask and at the American Hosiery Company this same thing is true, but to a greater extent. This factory works on its gas masks day and night and even society women have given up certain evenings each week to come to the factory to do certain work on these masks. The P. & F. Corbin division of the American Hardware Corporation is working on parts of gas masks, as well as hand grenades and other war goods, and the Stanley Works too, is making gas masks in addition to its cold rolled steel and other products. The Stanley Works has recently been given a war order said to represent a sum of nearly $1,000,000 and is for the manufacture of magazines for the new Browning machine gun, recently adopted as the official gun of the army. The production of the Browning machine gun magazine requires the most expert workmanship and mechanical genius and to this end the local concerns are cooperating and willingly share their secrets for the successful production.

The New Britain Machine Company, which has more than trebled in size since war orders began to arrive, is still working a night and day shift on its anti-aircraft gun mounts and other government goods. A large addition, being erected by the government, for this concern will be ready for occupancy in a few months. Castings for hand grenades are being made at the Vulcan Iron Works and hand grenade work has also been going on at the Union Manufacturing Company. While the Corbin Cabinet Lock is not doing any special war work, it is nevertheless, well supplied with government orders for its regular line of goods. Its locks are being used extensively on ships, new government buildings, barracks, etc.

The Landers, Frary & Clark plant, the largest concern manufacturing cutlery and domestic articles in the world, is now turning out war goods as it never has before. While this concern started its work on war goods in a humble way, it has branched out in an amazing manner. First the army had to be supplied with knives, forks, spoons, etc. Then came the demand for an increased production of bayonets and this concern profited. Later came the orders for trench knives and gas masks and for certain other equipment used by the infantryman. The Landers, Frary & Clark Company had previously taken over the old Trade school shops, with a railroad frontage, for manufacturing purposes and now on this same ground has erected a large four story factory building employing numerous women on stamping machines and other automatic devices. Among other articles turned out in this new factory are a peculiar cup, used by the army, made from aluminum.

But the manufacture of war goods is not confined to these factories. The Stanley Rule & Level Company, manufacturers of carpenters' tools, etc., has also turned its attention to helping the Allies and has already handled a number of big contracts. Among other things this concern is turning out small screw drivers used by gunsmiths and machine gun operators, as well as quantities of builders' tools needed at the various cantonments and army barracks. Were it not for the ghastly nature of the work being done here, the world might well point to New Britain and declare it to be floating on the top wave of prosperity. H. R. J.

PROVIDENCE, R. I.

April 8, 1918.

The many months of rush work and over-time schedules that have been experienced by the workers of metals of every description, now extending back for about four years has so revolutionized the metal trades that such conditions are becoming accepted as normal and as yet there does not appear to be any lessening of the drive. The labor problem continues to be an ever present and dominant one with young men leaving for the army, navy or government positions and duties almost every day. Many of the plants are replacing the men, as far as possible, with girls and women, retaining men for heavier and more important parts.

Each week witnesses the addition of metal plants in this vicinity to the already long list of concerns engaged in Government work of some description or other, either through direct contract or by sub-contract. Now that the fuel problem has been somewhat relieved the plants are speeding to their greatest capacity to make up for lost time. With the opening of a new month all factories will begin their daily schedules under the light saving proposition, an hour earlier, and it is hoped that this will tend to increase the aggregate of production.

The manufacturing jewelry industry and its cognate branches remains in a somewhat chaotic condition because of its position as a "non-essential." This line of the metal workers has been unusually handicapped during the past winter, and, as yet but comparatively little improvement has been experienced. Added to the fuel situation, was the curtailment of supplies of gold, silver, platinum—or at least irregular supplies; freight and express embargoes and import and export restrictions and the constant fear that men or factories might be commandeered by the government.

The plant of the R. Plews Manufacturing Company, manufacturers of tin cylinders and metal workers at Central Falls, is running a full time schedule, and has many orders ahead. The company is better supplied with material than has been the case for several months past, when the shipments of tin and other metals were delayed in transmission for indefinite periods.

The Newell Brass Foundry, at Central Falls, is being operated on a full time schedule, although the business is not so brisk as at some seasons of the year.

Excavations have been completed for the three proposed additional buildings at the plant of the Nicholson File Company, on Acorn street. These additions will be 30 by 59 feet, 30 by 43 feet and 32 by 60 feet, respectively; of brick, mill constructions, and two stories high.

The Brown & Sharpe Manufacturing Company is erecting an addition to a one-story steel and tile building at its plant on Promenade street, that is to be used as a dispensary when completed.

Articles of incorporation of the Providence Fittings Company, with a capital stock of $100,000 have been filed at the office of the Secretary of State under the laws of Rhode Island. Philip C. Joslin, Alfred G. Chaffee and Ira Marcus are the incorporators and the business incorporated is that

of a general machine shop business, to be located in Rhode Island or elsewhere.

The Jenkinson Machine and Tool Company, incorporated by Robert Jenkinson of Mansfield, Mass.; Robert S. Artoleva and Sebastian H. DiJeser, both of Providence, was granted a charter a few days ago by Secretary of State Parker. The concern is capitalized at $30,000 and will manufacture machine tools in this city.

The Temple Manufacturing Company, to be located in Providence, with a capital stock of $5,000 for the purpose of manufacturing fine tools, has been granted a charter by Secretary of State Parker. The incorporators are John M. Gebb, Carl A. Fingler and Joseph C. Condon. W. H. M.

ROCHESTER, N. Y.

Aside from the very unsatisfactory shipping situation conditions in Rochester, from a manufacturing viewpoint, are about as they were in February. There has been little change—at least it is not noticeable.

Practically every industry in the city is enjoying a better business drive just now than in many years at this particular time. This, of course, applies to domestic business, as there is not much doing for foreign shipment except for war purposes.

The railroad situation is really serious, transportation all ways being delayed and all shipments of materials being subject to indefinite delivery. Firms getting stocks delivered within two and three months after ordering are considered extremely fortunate.

In Rochester there is a shortage of steel and aluminum, neither of which can be obtained without much waiting. Big concerns are using the express companies to deliver finished and unfinished products, great trains of freight cars, bearing the printed labels of express companies, having passed through the city in either direction. These express shipments are made, however, on "freight time" basis. The express companies apparently obtain a right of precedence over regular freight shipments.

The time is approaching for the opening of the big war material plant about finished by Bausch & Lomb. Thousands of mechanics are being sought in all parts of the country, and the demand for all kinds of metals will be heavy in Rochester and vicinity during the coming year. The Symington cannon factory begins active operations next month. Copper, brass and bronze will be required in great quantities.

The copper and brass situation in Rochester is nominal. Supplies of both metals are in great plenty and easy to obtain, but the matter of delivery in this city is a problem. Still deliveries are better by two months than a year ago. Yellow brass in sheets is quoted here at 26c base. Brass rods are held at 24½c. Spelter is also easy to obtain, subject to delay, and is held at unchanged figures.

The aluminum market is the one stumbling block in the way of local users of the metal. Owing to the fact that the entire output at the present time is taken over by the French and Italian givernments, American concerns must do without or pick up odds and ends in storage about the country. The outlook in this line is hardly optimistic. G. B. E.

MONTREAL, CANADA

April 8, 1918.

The industrial situation in this city, the great manufacturing metropolis of the Dominion, has shown great improvement during the last two weeks of this month since the advent of favorable spring weather. The strength of the tin market may be gauged in further advances which have been made in solder and babbit metals. Locally supplies of tin are reported scarce, being almost unobtainable, owing to the heavy demand for same to be used on brass marine castings, whose specifications call for a heavy percentage of tin and an alloy low in lead. Little hope of relief is held out for the next month or six weeks, and ingot tin remains around $1.00 per pound. The advance in solder is 2 cents per pound, while the best grades of babbitt range as high as 90 cents per pound. The output of silver from the Cobalt mines so far this year has made a record and approximates 50,000 ounces per day. This is at the rate of upwards of two tons daily, or approximately 760 tons yearly. The value of the output with silver at 93 cents equals about $46,500 daily, or close to $17,000,000 annually. The value of last year's output approximated $16,000,000. The value of the output for 1916, which previously had the record as the highest in Cobalt's history, was $17,408,936. The indications are that the value of this year's production will exceed that of last year by $1,000,000 The Montreal Locomotive Works, the Canadian branch of the American Locomotive Company, has received an order for 80 locomotives from the Canadian Government Railways. The locomotives will have an approximate value of $60,000, so that the total order will aggregate some $4,800,000. This order accounts for the remainder of the 150 locomotives placed last month, the other 70 having been placed with the Canadian Locomotive Company. A large amount of brass and copper parts enter into the construction of these locomotives.

The Canadian plant of the Gillette Safety Razor Company, St. Alexander street, is very busy. The Gillette representative in Paris, France, cabled this month for 200,000 razors and 1,500,000 blades, to be shipped direct at once. The plant here will take charge of this order to a large extent owing to the facilities here for taking care of foreign shipments.

Building operations here are very dull and the demand for plumbing and hardware brass goods is very slow.

The Robert Mitchell Company, Ltd., one of the oldest brass manufacturing plants in Canada, and located on St. James street, is very busy in its foundry on outside castings, but the machine and finishing shops are running at a very low ebb, as they depend on the building and architectural class of work to keep them busy. P. W. B.

Count that day lost—whose low descending sun
Sees in your hand no Liberty Bond or Gun

CINCINNATI, OHIO

April 8, 1918.

Activity among machine-tool manufacturers and foundries supplying castings to the trade continues at an increasing rate in and around Cincinnati, hampered only by difficult transportation conditions and the relative scarcity of labor. The "Help Wanted" columns of the Sunday newspapers shows convincingly the need for additional labor in the big shops, but indications are that the scarcity will increase, rather than diminish, as the need for men in the Army and in such vital departments of labor as shipbuilding increases. A cheering sign of progress in the technical industries related to the metal trades, however, and one which reflects credit on the reputation Cincinnati has gained as a center for mechanical education of a practical sort, is the completion of arrangements by which young men from many colleges and technical schools at a distance will come to the Queen City to take advantage of the cooperative training plan devised in the School of Engineering of the University of Cincinnati.

At the annual dinner and meeting of the Cincinnati branch of the National Metal Trades Association, held at the Business Men's Club on March 7, some interesting and timely addresses were heard, including one by W. H. Vandervoor, of Moline, Ill., on "War Conditions," and by Charles A. Hinsch, president of the American Bankers' Association and of the Fifty-Third National Bank of Cincinnati, on "War Savings Stamps." Officers were elected for 1918 as follows: President, J. B. Doan; vice president, W. T. Emmes; secretary, C. A. Bicket; treasurer, H. W. Kreuzburg; executive committee, E. S. Sawtelle, J. W. Carroll and A. H. Teuchter.

The Troy Metal Products Company has been incorporated in Cincinnati with a capital stock of $300,000, by A. G. Stouder, W. H. Bowyer, J. E. Edgar, C. C. Willard and J. M. Spencer.

The Canton Chaplet and Manufacturing Company, of Canton, O., has been incorporated with a capital stock of $10,000 by A. R. Turnbull, G. S. Schaeffer, H. E. Case and Walter E. Schaeffer, taking over the business of a partnership operating the Imperial Fluid Gauge Company. The company will manufacture gasoline and oil gauges for automobiles, foundry chaplets, and other metal specialties. A. R. Turnbull is president, H. E. Case, vice president; Walter E. Schaeffer, sales manager, and G. S. Schaeffer, secretary and treasurer.

The Morgan Engineering Company, of Alliance, O., is proceeding rapidly with plans for the construction of a great ordnance plant at that place, with nine buildings and a force of 2,000 men. The George A. Fuller Company, of New York, is working on the construction of the buildings, which will give 500,000 square feet of floor space, and include an office building and a power heating plant.

The plant of the Canton, (O.) Brass Foundry Company was recently entered by thieves, who got away with 700 pounds of brass, as well as a number of tools.—K. C. C.

COLUMBUS, OHIO

April 1, 1918.

The metal market in Columbus and central Ohio territory is rather quiet for the time of the year. Railroad congestion and embargoes are holding up shipments to a large extent, and as a result there is considerable uncertainty about the situation. The larger metal using concerns show a tendency to accumulate some stocks, while the smaller concerns are following the policy of buying from hand to mouth.

The strongest feature of the Columbus market is the demand for type metals. These are especially strong and there is some shortage in stocks in certain localities. Babbitt is also strong all along the line.

Brass is fairly active and prices are unchanged from the previous month. There is also a good demand for copper stocks at government quotations. Aluminum is quiet and some weakness has developed recently. Tin and zinc are both rather active when the conditions are considered. Other metals show little change from the previous month.

The Atlas Brass Foundry Company will soon begin work on a three-story addition to its present plant in South Front street. Part of the first floor will be occupied by offices and the rest of the building will house additional machines and allow enlargement of the present tool room. This concern is very busy at present, and additional space is needed seriously. Construction of the new quarters will begin in a week and plans provided for completion within two months.

The Solar Metal Products Company has completed installation of a tinning plant, which will be put in operation within a week. This addition is necessary for tinning milk cans, a product which this concern has been manufacturing in small lots, but will in the future produce in larger quantities. Enlargement of the office and erection of a storehouse for raw materials are plans for the future under contemplation.

The Aluminum Rolling Mills Company of Cleveland, O., has been incorporated with a capital of $1,000,000 to make aluminum ware. The incorporators are F. H. Pelton, George B. Folk, William H. Marlatt, F. W. Treadway and Norton McKiffin.

The Humphrey Bronze & Aluminum Company of Bellefontaine, O., has been incorporated with a capital of $10,000 to make bronze and aluminum articles. The incorporators are Charles S. Humphrey, Eva D. Humphrey, William W. Riddle, John A. Parker and Jesse S. Kauffman.

The Cleveland Metal Products Sales Company of Cleveland, O., has been incorporated with a capital of $25,000 to deal in metal articles. The incorporators are George B. Folk, Frank H. Pelton, F. W. Treadway, E. G. Rushforth and Norton McGriffin.

The Allyne Brass Foundry Company of Cleveland, O., has decreased its capital from $25,000 to $3,000. J. W. L.

CLEVELAND, OHIO

April 8, 1918.

One of the most important projects affecting the metal industry of Cleveland has developed this week with the announcement by W. M. Pattison, of the W. M. Pattison Supply Company, that he soon will complete his findings in a survey, looking to the establishment of a Government warehouse here. The plan is to provide storage room for the products of factories in Cleveland which are working on army and navy Government contracts. It is the belief of Mr. Pattison that with adequate storage facilities, necessary to meet the congestion of rail and shipping, factories here could be from six weeks to two months ahead of their contracts. Lack of such storage facilities, he says, is causing many plants to slow up, as they are already taxed to capacity on storage room in their own plants. The plan is to provide such room for finished products, but many of the plants in the metal industry, providing semi-finished products, would thus be offered a greater outlet for their products. Mr. Pattison has left for Washington, where he is in consultation with the Emergency Fleet Corporation on shipping matters. He is the first of a group of Cleveland business men, appointed by Charles A. Otis, president of the Cleveland Chamber of Commerce, to enlist in Government service, and who have volunteered to go abroad if necessary to fulfill their commissions.

The Bellaire Enamel Company and the Jewett Enameling Company are planning to merge their interests. Under this arrangement the production of enamel ware will be resumed, and eight furnaces will be installed. New machinery will be installed. The new company probably will be known as the Bellaire Enamel Company, with S. J. Kapner as president and Jesse Landkrohn as secretary and treasurer. It is expected capital stock will be increased to cover the planned improvements.

Plans for a car to truck freight delivery system, for the benefit of West Side industry, are being considered by the West Side Chamber of Industry. The move is destined to save delay in unloading freight from cars on the track, according to A. E. Hyre, secretary of the Chamber. It will eliminate the handling in warehouses and cut demurrage rates through prompt delivery.

The Kaiser Started This—
You End It—Buy Liberty Bonds

New Americanization classes, in which men representing ten nationalities of foreign tongue, have been established by the Globe Machine and Stamping Company at its West Side plant. Mrs. Anna Castner is the teacher in English. This is part of the general movement among metal industry plants in this city to establish upon a solid basis the true American spirit among employees of foreign birth.

The Trumbull Bronze Company, in Warren, has been incorporated with a capital stock of $10,000. Incorporators are: M. A. Garveu, T. M. Boyle, A. J. Gilmore, T. P. Lyons and S. C. Graber.

Contract soon will be let by the Atlas Brass Foundry Company for a new factory building. The structure is to be three stories high on a plot 40 by 63 feet, and will cost about $15,000. John Whitman, Columbus, is president of the company.

Rolling mill of the American Zinc Products Company soon will be placed in operation, with six of ten mills installed. The output will be something more than 1,200 tons of sheet zinc monthly. President D. W. Kerr says he will receive material from the Ft. Smith Spelter Company, of which he also is president.

C. F. Mitchell & Sons, sheet metal manufacturers, plan the addition of two stories to its present Cedar avenue plant. The addition will cost about $35,000.—C. C. C.

DETROIT, MICH.

April 8, 1918.

Large numbers of the brass, copper and aluminum concerns and also most of the large automobile corporations are engaged in the production of munitions. It is learned the Harroun Motors Corporation has closed a $2,000,000 contract for the manufacture of shells. Another company, the Detroit Shell Company, is now reported turning out large quantities of this munition and is said to have a contract estimated worth several millions of dollars. The Ford Motor Car Company, it is announced, has practically cut its production in half and is now engaged in manufacturing liberty motors for

the United States army. These motors require much brass fittings.

The Ford company, like the other concerns with great plants here, is bending all its energies towards winning the war. The Packard Motor Car company is reported devoting the greatest part of its plant to the production of trucks for the army. It also has millions of dollars worth of contracts. The Maxwell Motor Car Company also is manufacturing small trucks and army motors. The same is true, it is reported, of Dodge Brothers, manufacturers of the Dodge motor car. These companies all maintain large brass, copper and aluminum plants. These are now transporting large numbers of motor cars and trucks to the Atlantic coast by the overland route.

The great Dodge Brothers plant under construction on the east side of the city will soon be producing gun recoils.

Innumerable of the smaller concerns also report heavy contracts for shells and other munition work.

It is gratifying to note that Detroit has had no labor trouble and none seems likely to occur. The highest wage is paid and the demand for skilled mechanics can not be filled. It is reported there are practically no idle men in Detroit.

The production of plumbers' supplies and steam valves seems to have fallen off to a large extent, and it is not believed this branch of the brass business will be materially improved during 1918.

The Enterprise Electric Plating & Manufacturing Company is one of the concerns here that does not seem to be affected by adverse war conditions. It reports large contracts with orders ahead that will keep its plant busy for many weeks.

F. J. H.

LOUISVILLE, KY.

April 1, 1918.

There has been no material change in the general situation in the Louisville district during the past few weeks. The copper and brass working plants and fairly busy on special castings of one kind or another, Government work, pattern work for manufacturers, and specialties of one kind or another used by manufacturers, most of whom are busy. There has been absolutely no distillery work out for several weeks and months past, as grain is so high that even alcohol distilling is dead. Plants which formerly manufactured distillery work are principally handling specialties and Government work at this time, there being some demand for copper work in chemical plants.

There has been a very active demand for milk machinery all season, and a number of local shops have been handling special castings, etc., for such work. Hines & Ritchey, local coppersmiths, have been giving practically their entire attention to milk machinery for some time past.

The brass foundry and all metal working departments at the L. & N. R. R. shops, Louisville, have been good and busy for several months past, as the company is building many new cars, and repairs are very heavy, due to the heavy traffic that is being handled. The company is also turning out many new engines, and building parts.

The labor situation has been a serious one for some time past, and following a strike of several days' duration of moulders, polishers, foundrymen, etc., the house of B. F. Avery & Sons was compelled to make a blanket increase of 20 per cent in wages. Men are very scarce and are hardly to be had at any price, resulting in top wages having to be paid.

There has been a decided improvement in the demand for plumbing supplies and manufactured brass goods within the past few weeks. At the present time the Standard Sanitary Manufacturing Company, enamelers and operators of a brass foundry and general plumbing supply house, are erecting a new warehouse to cost $75,000. This warehouse is made necessary by the slowness of traffic, which has resulted in the company having to stock large supplies of goods while awaiting cars.

The Foundry Equipment & Metals Company of Covington, Ky., capital $10,000, has been incorporated by Archer E. Clifton, L. A. Clifton and Frank X. Bertsch.

Louisville foundry operators are of the opinion that the daylight saving plan will prove beneficial and that it will work out very satisfactory. The average working man does not object especially to getting to work early, but is always stewing about having to work late in the evening. It is believed that under the new arrangement workmen will be better satisfied than heretofore.

Things are humming with the Independent Brass Works, according to Manager J. W. Rademaker, who stated that he had been very busy on Government work of one kind or another, milk machinery castings and pattern work. There has been no let up this season in the steady run of business.

Announcement recently coming from Washington, D. C., to the effect that the Government was planning switching metal orders from the Eastern district to the Central West have been received with enthusiasm in Louisville, where plants have a considerable capacity which could be devoted to Government work, including brass, copper and other work. The J. J. Reilly Pump Manufacturing Company, the house of Grainger & Company, have both been very busy on Government pump orders, while all boiler plants have been busy. However, these represent about the only really busy foundries.

The C. Lee Cook Company, metal workers, with large Government contracts for brass and metallic packing rings, has been working overtime for several months, and apparently is merely getting a good start on the heavy Government orders which are steadily coming in.

At Evansville, Ind., the Hercules Gas Engine Co. is building a $150,000 addition to its plant, bids having been taken on March 15.

Louisville manufacturing jewelers have been unusually busy all spring, and the shops have been busier than in any previous spring for several years on new work and repair work. There has been a large volume of old gold and metals coming into the shops for redemption during the past few months, although very little platinum is being offered. Government regulation of platinum has caused some of the manufacturers considerable trouble. In one case a customer brought in some old platinum mixed with other metal, filings, etc., to be refined. The manufacturer representing the retailer sent it on to a Chicago refinery, which remitted the price of the platinum, which was turned over to the authorities. While manufacturing jewelers are not permitted to work in platinum, at the same time they haven't a right to sell material intrusted in their care, and such treatment appears a bit highhanded.

O. V. N. S.

A Better Investment Than a Liberty Bond—Two Liberty Bonds

TRENTON, N. J.

April 8, 1918.

While Trenton manufacturers are now supplied with coal, they claim that the product being supplied this spring is of very poor grade and gives considerable trouble in keeping up steam. During April there is a reduction of 40 cents a ton on coal and manufacturers are going to get in next winter's supply. A number of fusemakers who were employed at the Standard Fuse Corporation plant at Bordentown are now employed at the government shell making plant near Whiting's Station. All the Trenton metal plants are busy at the present time.

The John A. Roebling's Sons company granted a voluntary raise to its several thousand employes. This raise affects all the copper and brass workers and caused big rejoicing among the various departments. The increase is five cents per hour for the day workers and in addition to the salary boost there was an adjustment made on the piece work scale whereby it resulted in a uniformity of pay for additional workers.

The Westinghouse Lamp Company, which recently erected a $1,000,000 plant on Pennington avenue, has inaugurated a new plan whereby seventy-five of its girls and young women

employes are engaged in working for the Red Cross. The unit is under the direction of Mrs. Grace Porter, the head nurse at the plant. The unit has turned out several thousand compresses during the evening hours. The Westinghouse company paid for the equipment of the big workroom besides allowing its employes to devote considerable of the working hours for the work. The instructors are Miss Grace Campbell, Miss Sutton, Miss Dorety, Mrs. I. H. Goehrig, Mrs. Solon and Miss Walker. The company is very busy at the present time and is unable to keep up with its many big orders. All the young women in the unit are engaged in operating lamp making machines.

The Olive Loading Company has been incorporated with a capital stock of $500,000 to manufacture and deal in metal goods. The incorporators are: T. A. Gillespie, R. I. Oliver and T. H. Gillespie, all of New York. The office of the new company is in Jersey City and a plant will be erected later to manufacture the goods.

The Peerless Watchman's Clock Company, Inc., of South Orange, has been incorporated with the secretary of state with a capital stock of $75,000 to manufacture and deal in dials. The incorporators are E. L. Prior, of Maplewood; W. M. Vinnedge, of Brooklyn, and H. T. Stetson, of Orange.

The Bronze Art Fixture Company, of Newark, has been incorporated with a capital stock of $25,000 to manufacture gas fixtures. The incorporators include William D. Donovan, Russell Fleming and Matthew Bird.

The Old Dominion Copper Company has been permitted to file a certificate of dissolution under a decision of the Court of Errors and Appeals, affirming the Supreme Court in its ruling against the contention of Secretary of State Martin.

The National Metal Stamping & Manufacturing Company, 190 Murray street, Newark, will erect a one-story machine shop and foundry, brick and steel, 90 x 120 feet, to cost $30,000. The contract has been awarded to the Austin Company, of Philadelphia. The American Reclaiming and Refining Company, Bayonne, has been incorporated under the laws of New Jersey to reclaim and refine metals. The new company has a capital stock of $250,000 and the incorporators are Bernard Rubin, Charles Dembe and H. B. Dembe, all of Bayonne.

The National Anode Company, Passaic, N. J., has been incorporated with $100,000 capital to manufacture copper castings. The incorporators are: Albert R. Bray, William F. Rothlisberger, all of Newark.

The Titeflex Metal Hose Company, Runyon street, Newark, N. J., will erect a one-story storage building to its plant.

C. A. L.

PHILADELPHIA, PA.

April 8, 1918.

A dinner was given Wednesday night, March 6, by the Philadelphia Foundrymen's Association at the Manufacturers' Club, at which a paper was read by Frank D. Chase, an industrial engineer from Chicago, on "Efficient Plants of the Modern Foundrymen."

A scarcity of labor is noted among the metal trades of Philadelphia. The schedule of wages laid down recently by the shipyards and other plants engaged in government work show a high rate is being given to employees and men in the trade are giving this as the cause of labor unrest, as many of the employees have been lured away from local concerns by the more lucrative wages that are offered. Particularly is a scarcity of machinists noticeable among the local metal trades.

RED CROSS WORKERS AT THE PLANT OF THE WESTINGHOUSE LAMP COMPANY, TRENTON, N. J.

The quarterly meeting and dinner of the Metal Manufacturers' Association of Pennsylvania was held Wednesday, March 13, at the Bellevue-Stratford. A discussion of the question of the feasibility of using female help in metal plants here was held, in an effort to combat the scarcity of labor that is existing. Representatives of several firms who are using women in work formerly engaged in by men told of their experiences with female help.

A fair demand for copper is noticeable as the month closes with stocks reported as arriving better than for several months, although the supply of the metal is still scarce here.

Tin is reported in good demand with supplies scarce owing to transportation facilities.

Men in the metal trade are discussing the recent announcement by the War Industries Board that they have decided to withhold priority of transportation from all industries that are not essential for the conduct of the war.

Paul R. Ketzer, formerly manager of the Ketzer Machinery Company, this city, has become manager of the machinery and engineering department of the W. H. Robinson and Company, Real Estate Trust Building. It has been announced that the Ketzer Machinery Company has been consolidated with the Robinson Company and the new department will

conduct an export and domestic business in machinery and allied trades.

The marked decrease in accidents among foundry workers due to the employment of safety devices was discussed Monday night, March 25, at a meeting of the Philadelphia Branch of the National Safety Council in the Engineers Club by Henry W. Outerbridge, chief chemist, of William Sellers and Company. H. B. Harmar of the Philadelphia Electric Company presided.

The market for aluminum is reported quiet at the end of the month at the price of thirty-two cents a pound which was recently established.

The Apex Metal and Rubber Company, 716 South Eleventh Street, has brought suit in the Municipal Court against the Philadelphia Brass Company, Commercial Trust Building, to recover $580.81 said to be due for merchandise sold.

Announcement has been made that the Kensington Brass Foundry and Manufacturing Company, of this city, has been incorporated in Delaware with a capital of $50,000, to manufacture brass, iron and steel products. The incorporators are Thomas W. Moore, J. D. Levy and L. V. Gilliam, all of this city.

The Queen Metal and Rubber Company has filed a statement of claim in the Common Pleas Court in a suit brought against the McCambridge Company, Twentieth and Wood streets, to recover $1,141.35, said to be due for castings sold and delivered. The same concern has also filed a statement in an action against the Excelsior Brass Company, to recover $612.39 alleged to be due on three notes executed in October, 1917.

Lead was in fair demand early in the month but towards the latter part quieted down and prices showed a decline. No great quantity of the metal is available although consumers' needs are said to be lighter. The trade say that improved railroad traffic has had considerable to do with releasing much lead that has been held up owing to lack of facilities. The stock that is arriving is said to be sufficient to meet the existing demand.

The George Sachsenmaier Company, of Philadelphia has been incorporated with a capital of $200,000 to manufacture machinery.

The electro plating trades report that business shows little activity although they are optimistic that April will prove much better as far as trade is concerned. F. W. C.

VERIFIED NEWS OF THE METAL INDUSTRY FROM SCATTERED SOURCES

The Waterbury Manufacturing Company, Waterbury, Conn., is building an addition to its plant, 46 x 66 feet.

The General Aluminum & Brass Manufacturing Company, Boulevard and St. Aubin avenue, Detroit, Mich., is building a one story factory at an estimated cost of $25,000.

The Atlas Brass Foundry Company, Stewart and Front streets, Columbus, Ohio, will soon award the contract for a three story, 40 x 60 feet, machine shop at an estimated cost of $20,000.

The Traut & Hine Manufacturing Company, New Britain, Conn., manufacturers of metal specialties, is erecting a building 31 by 34 feet, which will be used entirely as a new office and for recreation purposes for the employees.

The Columbian Bronze Corporation, Freeport, L. I., N. Y., is erecting an addition to its works on North Main street to more, who have been with the concern more than nine months, will receive $100 each.

The Eastern Brass Works, Newark, N. J., has filed a notice of organization to operate a plant at 221 Thirteenth avenue. The officers of the company are: R. O. Pfeiffer, president; O. Jaehnig, vice-president; J. C. Rall, treasurer. The company manufactures brass and bronze goods and ship hardware and operates a brass and bronze foundry, brass machine shop, tool and grinding room casting shop, spinning, tinning, brazing, soldering, plating, polishing, japanning and lacquering departments.

E. L. Watrous Galvanizing Company have arranged a demonstration plant at Pittsburgh, Pa., and announce that they are prepared to make appointments to demonstrate the working of the Watrous process of hot galvanizing. In this process the articles to be galvanized are dipped as usual into the molten metal and then placed in a rapidly revolving basket which shakes off

The Third Liberty Loan—Make It "Three Strikes and Out for the Kaiser"!

cost about $15,000. The company has a bronze foundry, brass machine shop, grinding room and polishing department.

The Artistic Lighting Fixture Corporation, designers and manufacturers, 21-25 East Houston street, and J. Trichlinger, electro-plater, 3 Bedford street, New York City, have been consolidated under the name of the Artistic Lighting Fixture Corporation.

The Western Brass & Manufacturing Company, 2007 Marshall Boulevard, Chicago, Ill., is erecting a one-story addition to its brass foundry. The company operates a brass, bronze and aluminum foundry, brass machine shop, tool and grinding room, stamping, soldering, brazinz, plating, polishing, japanning and lacquering departments.

The Dayton Bronze Bearing Company, Dayton, O., has plans under way for the erection of a large plant addition and the installation of considerable new equipment for the manufacture of brass, bronze and aluminum castings. The company operates at present a brass, bronze and aluminum foundry and only recently increased its capital stock from $10,000 to $30,000.

The Aluminum Goods Manufacturing Company, Manitowoc, Wis., announces that it will distribute $100,000 among its 2,000 employes in Manitowoc and at the Two Rivers, Wis., plant. The distribution of the large fund is a profit sharing by the employes with the company. Persons earning $1,000 a year or all surplus zinc and leaves the work with a smooth, uniform finish. A substantial saving is made both in time and in metal recovered.

The American Bronze Company, Lancaster avenue, Berwyn, Pa., has awarded the contract for the erection of a 1-story, 83 x 120 feet foundry, the estimated cost of which, together with additions, is $45,000. The total cost of the improvements which the company are making to its plant will cost about $110,000 and will be completed in about ninety days. The company operates a bronze foundry, brass machine shop, tool and grinding room.

The Michigan Copper & Brass Rolling Mills, Detroit, Mich., now has in operation a new thin metal mill for the production of metal such as is used for the manufacture of motor radiators. The company operates a casting shop and rolling mill. The officers of the company are: David M. Ireland, president; James T. Whitehead, first vice-president; Hal H. Smith, second vice-president; Alonzo P. Ewing, general manager; Alfred L. Simmons, secretary; John L. Connell, treasurer, and David Burgess, general superintendent.

The Wah Chang Mining & Smelting Company, Ltd., a corporation of China, announces that the exclusive rights to sell antimony, tin, tungsten, zinc, lead and other products of the Wah Chang Mining & Smelting Company, Ltd., in the United States have been given to the Wah Chang Trading Corporation, a corporation of the State of New York, with offices at

233 Broadway, New York City. It is expected that this change will offer opportunities for even better service to their customers.

The controlling interest in the **American Brass Novelty Company,** manufacturers of brass castings and sheet metal stampings, Grand Haven, Mich., has been purchased by Charles D. Reeve, vice-president and general manager of the Grand Rapids Brass Company and D. J. Gorman, eastern representative of the Keeler Brass Company. Harry L. Ackerman will act as assistant superintendent and Charles Dalavini will have charge of the machinery department. The plant at present employs seventy-five men.

The National Metal Stamping & Manufacturing Company, 190 Murray street, Newark, N. J., manufacturers of lighting fixtures, metal shades, etc., is building a one-story brick and steel shop and foundry addition, 90 x 120 feet, to cost $25,000, and which they expect to have completed by April 18. The plant is at present engaged in manufacturing powder tanks for the navy, and which order will amount to about two million dollars. The company reports that they will shortly be in the market for brass foundry equipment and that at present they operate a brass machine shop, tool and grinding room and stamping, galvanizing, tinning, soldering, plating, polishing, japanning and lacquering departments.

You don't need a Bank Account to Buy Liberty Bonds

ELECTION OF OFFICERS

The following officers were elected by the **National Brass and Copper Tube Company,** Hasting-on-Hudson, N. Y., for the ensuing year: George J. Jackson, president; Morton A. Howard, vice-president and H. J. Pritchard, secretary and treasurer.

The Cleveland Brass & Copper Mills, Inc., Cleveland, O., at the annual meeting of the stockholders re-elected its board of directors and appointed the following officers for 1918: H. C. Osborn, president; B. F. Brusstar, vice-president and general manager; B. M. Gardner, secretary and sales manager, and H. P. McIntosh, Jr., treasurer.

REMOVAL

The American Zinc Products Company, manufacturers of slab spelter and sheet zinc, has moved its general offices from Warren, Ohio, to Greencastle, Ohio.

The United Smelting & Aluminum Company, New Haven, Conn., has moved its New York City office from 24 Stone street, to Rooms 2316-2318, Woolworth Building, 233 Broadway, New York.

The main offices of the **Amalgamated Brass Company** of Cincinnati, O., have been moved to their new plant at Blanchester, O. The company operates a brass foundry, brass machine shop, tool and grinding room and casting shop.

BUSINESS TROUBLES

Notice has been sent under date of March 19 to the creditors of the Philadelphia Brass Company, Downington, Philadelphia, Pa., that at a conference held in Philadelphia on March 15, it was arranged for a committee to investigate and determine upon the best course to pursue with reference to the troubles of the company. It is believed that there are sufficient assets to fully pay all claims against the property and it is earnestly desired that no legal action should be taken pending investigation.

Under date of March 26, 1918, Augustus P. Loring and Harry P. Dodge of Boston, Mass., announce that they were appointed receivers of the **Metals Production Equipment Company** of Springfield, Mass. The receivers state that they made application in the District Court of the United States for leave to borrow money and to issue certificates of indebtedness on April 1. Judge Dodge of the District Court set April 4, 1918, as a day for the hearing the application, but at the time of going to press news of whatever action was taken has not been received.

YALE & TOWNE REPORT

The Yale & Towne Manufacturing Company, makers of brass goods, Stamford, Conn., reports for year ended December 31, 1917:

	1917.	1916.	Inc.	Dec.
Total net earnings	$2,867,510	$3,286,426	.....	$518,916
Depreciation	323,669	662,579	.....	338,910
Federal taxes	553,850	.....	$553,850	.....
*Net profits	1,989,991	2,723,847	.....	733,856
Dividends	989,614	1,513,539	.....	523,925
Surplus	1,000,377	1,210,308	.....	209,931
Profit and loss surplus	8,259,509	7,259,132	1,000,377	.....

*Equal to $40.21 a share on $4,948,070 capital stock as compared with $57.86 a share on $4,731,400 capital stock in 1916.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To manufacture brass, copper and other metal goods.—The Aldrich Manufacturing Company, Buffalo, N. Y. Capital, $400,000. Incorporators: Isaac A. Aldrich, Leo Wertheiner, Charles S. Hunt, Sal. J. Ginsburg and Fred Genge. The plant is located at 55-57 Illinois street and the company operates spinning, stamping, soldering, plating and polishing departments.

To operate a brass foundry and machine shop.—The Menten Brass Company, Brooklyn, N. Y. Capital, $25,000. Incorporators: Alfred J. Menten, Blanche E. Menten and Ruby Weller. The company has a plant at 76-78 Lexington avenue, Brooklyn, N. Y., and will operate a brass, bronze and aluminum foundry, brass machine shop, grinding room and plating and polishing departments.

To conduct a general foundry business.—The Western Foundry & Machine Company, Moline, Ill. Capital, $30,000. Incorporators: A. C. and R. S. Sinclair, and J. H. Johnson. The company will operate a brass, bronze and aluminum foundry, brass machine shop, tool and grinding room, casting shop, cutting-up and soldering, plating, polishing, japanning and lacquering departments.

To manufacture metal products.—The Troy Metal Products Company, Troy, O. Capital ,$300,000. Incorporators: A. G. Stoudel, Herbert L. Johnson and others. It is reported that a plant will be located in the Camp Washington district of Cincinnati, and it is understood that the bulk of the product will be for the government. The company will operate a tool room, tinning, brazing and plating departments.

RESTRICTED IMPORTS

The War Trade Board at Washington, D. C., by Vance McCormick, chairman, has issued under date of March 23, 1918, a list of restricted imports No. 1.

Under the power conferred upon him by the Trading with the Enemy Act, the President, on February 14, 1918, issued a proclamation which required an import license for all articles from all countries. The chief purpose of this was to enable this Government to eliminate less essential imports to the end that tonnage might be conserved and additional shipping be made available for the transportation of troops and supplies to Europe. Similar steps have been found necessary by the other allies, and England particularly has found it necessary to impose most drastic import restrictions in order to most effectively devote her shipping to the successful prosecution of the war.

For many weeks past a corps of specialists have been giving the closest study as to the manner in which this import restriction could be exercised so that the greatest saving could be accomplished with the least injury to our ordinary commercial activities. The question was still further complicated by the earnest desire of this Government to affect as little as possible the industry and commerce of the countries associated with us in the war, and to work as little hardship as possible to neutrals. The question involves close co-operation with the Shipping Board and consultation with the State Department, the Treasury Department, the Food Administration and other branches of the Government, as well as the War Trade Board, within whose province falls the actual administration of the control. As a result of these deliberations, the War Trade Board, through its bureau of imports, publishers the first list of restricted imports.

Applications for license to import the articles appearing on the list will not be granted except under the following circumstances:

(1) When the articles mentioned are actually shipped from abroad prior to April 15, 1918.

(2) When coming by rail from Mexico or Canada when the goods in question originated in those countries or in others from which such goods are being licensed for import.

(3) When coming as a return cargo from European points and then only: (a) when coming from a convenient port; (b) when loaded without delay and (c) when the importation from Europe is not specifically prohibited in said list.

In the future, therefore, applicants for licenses to import articles mentioned in the list will be obliged to show in their applications the existence of such of the facts above outlined as will warrant the granting of such licenses. In the case of shipments from European points, the most satisfactory evidence will be proof that shipping space has been actually engaged. The present form of application for import license will generally be found adequate for this purpose, and where this is not found to be the case, a letter setting forth the additional facts should accompany such application.

The list contains the following articles essential to the metal industry:

All acids.

Muriate of ammonium (chloride of ammonium). All salts of sodium except nitrate and cyanide.

Cryolite, except not to exceed 2,000 long tons for the year 1918.

Fluor Spar.

Gold and silver manufactures, including jewelry.

Infusorial and diatomaceous earth and tripoli.

Nickel.

Plumbago or graphite until July 1, 1918. Thereafter not exceeding 5,000 long tons for remainder of 1918.

Zinc.

The advertisement of the **Tolhurst Machine Works**, Troy, N. Y., manufacturer of centrifugal metal drying machines, was incorrectly indexed in the March issue of THE METAL INDUSTRY. It appeared on page 31, not on page 23 as listed.

Your Money or Their Lives
Save Both—Buy Liberty Bonds

PRINTED MATTER

Pure Sheet Nickel.—The Driver-Harris Company, Harrison, N. J., recently issued an extensive bulletin on the subject of Pure Sheet Nickel. Another bulletin on Nichrome wire mesh containers for heat treating and acid cleaning has also been published.

Electrical Machinery. The General Electric Company, Schenectady, N. Y., has issued indices to the various catalogs and other advertising literature produced by this company. The first of these indices is devoted to descriptive bulletins and sheets, while the second applies to supply part bulletins. Copies of either or both of these indices may be had upon application.

Metal Statistics—1918—The American Metal Market Company, New York, has issued Metal Statistics for 1918. This little book, which contains 430 pages, carries statistics of iron, steel and metal products in concrete form which have been published every day in the columns of the American Metal Market and Daily Iron and Steel Report. The feature of this year's issue of Metal Statistics in the forty page buyers' directory which is included at the back of the book.

Express Classification. The Express Traffic Association, 61 Broadway, New York, has issued Supplement No. 5 to the Official Express Classification No. 25, which applies on the express traffic of the twelve express companies making up the association. The bulletin gives the changes which have been made for marking requirements for shipments of castings, machine parts, pipes, rods, bars and other metal articles. These regulations go into force on May 1, 1918, and copies of the bulletin may be had upon request.

Polishing Compounds—The Norton Company, Worcester, Mass., has issued a very interesting little booklet on Polishing—What to Use and How to Use It. This booklet, which contains twenty-four pages, is devoted to descriptions of Alundum and Crystolon. In addition to the text matter describing these products there are a number of photographs of the surfaces of various metals after the various operations of grinding, roughing and polishing have been performed on them with these polishing materials. The booklet also contains a chapter on polishing wheels and directions for their setting up and so on.

METAL STOCKS MARKET QUOTATIONS

NEW YORK, April 8, 1918.

	Par	Bid	Asked
Aluminum Company of America	$100	560	610
American Brass	100	230	235
American Hardware Corp.	100	128	132
Bristol Brass	25	41	43
Canadian Car & Foundry, com.	100	24	26
Canadian Car & Foundry, pfd.	100	60	63
Eagle Lock	25	70	75
International Silver, com.	100	42	52
International Silver, pfd.	100	76	79
New Jersey Zinc	100	242	247
Rome Brass & Copper	100	300	345
Scovill Manufacturing	100	455	470
Standard Screw, com.	100	235	245
Standard Screw, "A" pfd.	100	102	106
Yale & Towne Mfg. Co.	100	210	220

Corrected by J. K. Rice, Jr., & Co., 36 Wall St., New York.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REVIEW

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE.

April 8, 1918.

COPPER.

With prices fixed at 23.50c. per pound in the copper industry until June, the principal interest in the trade during March was centered in the statistical position of the metal—in production, exports and imports in their relation to meeting the war needs of the United States and Allies; it being necessary promptly to fill such requirements. Domestic consumption is increasing somewhat, the non-essential industries buying a little more freely. Small consumers of copper have been able to supply their needs by purchases of scrap at lower prices than the Government price of 24.67½c. per pound in the major market for less than carload lots. This accounts for the shading by jobbers of the price on new material reported late in the month.

TIN.

Spot tin in March was practically unobtainable because of acute scarcity, the price being nominally 85c. per pound. Arrivals at Atlantic ports during the month were 1,637 tons, deliveries being 1,700 tons. Pacific port figures are not yet available. Stocks and landing, March 31, in New York were 134 tons and 6,300 tons were reported afloat.

LEAD.

Business in lead during early March was in fair volume, with prices 7.25c., New York, as the basis of the Trust and in the outside market for shipments from the West. The spot market in New York was quoted at 7.37½c. per pound, in St. Louis at 7.00c. Ore, after advancing to $87.50, declined to $85 per ton.

SPELTER.

Conditions in the spelter market failed to improve during March, business dragging along with small recessions in prices at intervals, until at the close quotations were ¾c. per pound lower than at the beginning of the month. Prime Western at the end of the month was held at 7.30c., New York, and at 7.12½c., East St. Louis. Sheet zinc, also under Government regulation, was sold at 15c. per pound. The market was in a depressed condition, due to over-production during 1917, and from which it has not yet recovered.

ALUMINUM.

The main feature of interest to the Aluminum trade in March was in the differential prices, established by the Government in its control of the market through the War Industries Board, and based upon the maximum rate, 32c. per pound for 50-ton lots and over of the 98-99 per cent pure metal as follows:

For 50 tons and over of 99 per cent plus aluminum, 32.20c.; for granulated, 32.40c. per pound. For 98-99 per cent metal, 32c.; for the granulated metal, 32.20c. For 94-98 per cent aluminum, 31.20c.; for the granulated, 31.40c. For No. 12 metal, 32.20c. per pound. For 15 tons the price of 99 per cent aluminum is 32.20c., the granulated 32.50c., while one-ton lots may be sold for 32.40c. and 32.60c. for the granulated of this quality. The 98-99 per cent aluminum in 15-ton lots is 32.10c.; one ton, 32.20c.; the granulated, 32.30c. for 15 tons and 32.40c. for one ton. Metal 94-98 per cent in 15-ton lots is 31.30c, and one-ton lots 31.40c.; the granulated of this grade being 31.50c. for 15-ton lots and 31.60c. for one-ton lots. No. 12, in 15-ton lots is 32.30c., and for one ton 32.40c.

These prices are for cash, f. o. b. plant, for ingots. The base price for sheets was established at 40c. cash, f. o. b. mill, for 20 gauge or heavier. No price for scrap has been given. An important point yet to be settled is the status of existing contracts between consumers and dealers, some of which were negotiated last year and that run throughout 1918.

ANTIMONY.

Early in March some business in 25-ton lots of spot antimony was done at 13.25c. per pound, duty paid, while nominal quotations were 13.37½c.-13.62½c. per pound. In the absence of buying as the month progressed prices receded to 12.50c. for spot, while shipments from China and Japan were offered at 11.75c.-12c., in bond, New York. The net decline on spot antimony was ⅞c. per pound.

SILVER.

Silver opened at 85⅛c. per ounce, gradually advancing to 92⅞c. on the 25th, after which there was a decline of ¾c. to 92⅛c., registering a net advance of 7c. per ounce for the month. Agreement was reached during the month between officials of the Treasury Department and Congressional leaders for the smelting and sale of over 200,000,000 silver dollars held in the Treasury of the United States.

QUICKSILVER.

On March 1 the price of quicksilver was advanced from $115 per flask to $125; later, about the time when rumors were current that the Government would take stricter measures in regulating the metal, an inside limit, $120-$125 per flask, was quoted, this price remaining in force at the end of the month. Government needs of quicksilver are heavy, the metal being used largely not only in medicines for the army and navy, but in the manufacture of munitions as well as in paints used in shipbuilding.

PLATINUM.

Germany's conquests in Russia, from which country has come our main supply of platinum, has resulted in the purchase by Germany of the entire available Russian supply of the metal. The United States Government, on March 1, commandeered all platinum supplies in this country, the price to be paid was not announced, but $90 was mentioned in the trade as the probable figure. During the month regular market quotations were unchanged at $105 for pure and at $113 for 10 per cent iridium.

The Government will not handle directly the present stock, but will permit its shipment by producers and dealers, subject to certain conditions. When a reasonable price for crude, refined and alloyed platinum has been decided upon notice will be given, with blanks to be used in governing distribution and deliveries.

OLD METALS.

Advances in the prices of old metals in March were ½c. on uncrucibled copper wire, 1c. each on No. 1 composition turnings and on cocks and faucets, 1½c. on solder joints, 2c. each on No. 1 pewter and clean red car boxes and 12c. per pound on block tin pipe, which rose to 70c. at the close. Declines were ¼c. on heavy lead, 2c. each on old zinc scrap and old cast aluminum and 2c. on new aluminum. At the close, brass founders were calling for crucible copper and composition scrap, while type shells and money scrap were also in good demand.

WATERBURY AVERAGE

Lake Copper. Average for 1917—30.97. 1918—January, 23.50. February, 23.50. March, 23.50.

Brass Mill Spelter. Average for 1917—11.116. 1918—January, 9.60. February, 9.60. March, 9.40.

MARCH MOVEMENT IN METALS

	Highest	Lowest	Average
COPPER:			
Lake	*23.50	*23.50	*23.50
Electrolytic	*23.50	*23.50	*23.50
Casting	*23.50	*23.50	*23.50
TIN	market nom.; no metal offering		
LEAD	7.75	7.25	7.40
SPELTER	7.90	7.25	7.646
ANTIMONY	13.62½	12.50	13.119
ALUMINUM	40.00	†32.00	32.79
QUICKSILVER (per flask)	$125.00	$125.00	$125.00
SILVER (cts. per oz.)	92⅞	85⅛	87.91

*Government price. †Government price for carload lots, effective since March 5.

Metal Prices, April 8, 1918

NEW METALS.

	Price per lb.
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Electrolytic, carload lots, nom.. / Lake, carload lots, nominal.... (Government price)	23½
Casting, carload lots, nominal	23½
TIN—Duty Free.	
Straits of Malacca, carload lots	none offered
LEAD—Duty Pig, Bars and Old 25%; pipe and sheets.	
20%. Pig lead, carload lots	7.25
SPELTER—Duty 15%	
Brass Special	7.30
Prime Western, carload lots, nominal	7.125
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½ per lb.	
Small lots, f. o. b. factory.... / 100-lb. f. o. b. factory..... / Ton lots, f. o. b. factory..... (Government price)	32.20
ANTIMONY—Duty 10%.	
Cookson's, Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot	.12¾
NICKEL—Duty Ingot, 10%. Sheet, strip and wire 20% ad valorem.	
Shot or Ingots	50c.
ELECTROLYTIC—5 cents per pound extra.	
MANGANESE METAL	Nominal
MAGNESIUM METAL—Duty 25% ad valorem (100 lb. lots)	$2.25
BISMUTH—Duty free	$3.65
CADMIUM—Duty free	nominal $1.50
CHROMIUM METAL—Duty free	.75
COBALT—97% pure	$3.50
QUICKSILVER—Duty, 10% per flask of 75 pounds	$125.00
PLATINUM—Duty free, per ounce	$108.00
SILVER—Government assay—Duty free, per ounce	.92⅛
GOLD—Duty free, per ounce	$20.67

INGOT METALS.

	Price per lb.
Silicon Copper, 10% according to quantity	42 to45
Silicon Copper, 20% " "	50 to55
Phosphor Copper, guaranteed 15% " "	57 to62
Phosphor Copper, guaranteed 10% " "	55 to60
Manganese Copper, 30%, 2% Iron " "	65 to72
Phosphor Tin, guaranteed 5% " "	1.10 to1.15
Phosphor Tin, no guarantee " "	95 to1.00
Brass Ingot, Yellow " "	17 to19
Brass Ingot, Red " "	25 to26
Bronze Ingot " "	24 to25½
Parsons Manganese Bronze Ingots " "	30½to32
Manganese Bronze Castings " "	44 to50
Manganese Bronze Ingots " "	26 to30
Phosphor Bronze " "	24 to30
Casting Aluminum Alloys " "	38 to39

OLD METALS.

Dealers' Buying Prices.	Dealers' Selling Prices.
22.00 Heavy Cut Copper	23.50
22.00 Copper Wire	23.50
19.00 Light Copper	21.00
21.00 Heavy Mach. Comp.	23.50
14.00 Heavy Brass	16.00
10.50 Light Brass	12.50
13.00 No. 1 Yellow Brass Turning	15.00
18.00 No. 1 Comp. Turnings	21.00
6.50 Heavy Lead	6.75
6.00 to 6.25 Zinc Scrap	6.25 to 6.75
10.00 to 13.00 Scrap Aluminum Turnings	11.00 to 14.00
18.00 to 20.00 Scrap Aluminum, cast alloyed	20.00 to 22.00
26.00 to 28.00 Scrap Aluminum, sheet (new)	28.00 to 30.00
50.00 No. 1 Pewter	50.00
22.00 to 23.00 Old Nickel anodes	25.00 to 26.00
30.00 to 32.00 Old Nickel	34.00 to 36.00

PRICES OF SHEET COPPER.

Mill shipments (hot rolled)	31½c. base net
From stock	33c. base net

The following table shows the advance in cents per pound over the base price of sheet copper of various gauges, lengths and widths.

SIZE OF SHEETS.		64 oz. and over.	32 oz. to 64 oz.	24 oz. to 32 oz.	16 oz. to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
Width.	LENGTH.	CENTS PER LB.				CENTS PER LB. OVER BASE.				
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins., but not Wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins., but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins., but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins., but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins., but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6							
	Longer than 120 ins.	5	8							
Wider than 120 ins., but not wider than 132 ins.	Not longer than 132 ins.	6	9							
	Longer than 132 ins.	7								
Wider than 132 ins.		8								

[The insert shows the extras on copper sheets from 10, 9, 8 and less than 8 oz. in weight, and various lengths and widths.]

Width.	LENGTH.	Light than 8 oz.	8 oz.	9 oz.	10 oz.
Not wider than 30 ins.	Not longer than 72 inches.	9			3
	Longer than 72 inches. Not longer than 96 inches.		6	9	6
Wider than 30 ins., but not wider than 36 ins.	Not longer than 72 inches.			4½	7½
	Longer than 72 inches. Not longer than 96 inches.				
Wider than 36 ins., but not wider than 48 ins.	Not longer than 72 inches.				

The longest dimension in any sheet shall be considered as its length.

Metal Prices, April 8, 1918

Extras for Copper Sheets.

Circles, 8 in. diameter and larger, segments and pattern sheets, advance per pound over prices of sheet copper required to cut them from..... 3c.

Circles less than 8 in. in diameter, advance per pound over prices of sheet copper required to cut them from..... 2c.

Cold or hard rolled copper, 14 oz. per square foot and heavier, advance per pound over foregoing prices..... 1c.

Cold or hard rolled copper, lighter than 14 oz. per square foot, advance per pound over foregoing prices..... 2c.

Cold rolled annealed copper, the same price as cold rolled copper.

All polished copper, 20 in. wide and under, advance per square foot over the price of cold rolled copper..... 1c.

All polished copper, over 20 in. wide, advance per square foot over the price of cold rolled copper..... 2c.

For polishing both sides, double the above price.

The polishing extra for circles and segments to be charged on the full size of the sheet from which they are cut.

Cold rolled copper, prepared suitable for polishing, same prices and extras as polished copper.

All planished copper, advance per square foot over the prices for polished copper..... 1c.

Tinning.

Tinning sheets on one side, all sizes, per square foot, 5c.

For tinning both sides double the above price.

Extra for tinning or polishing circles and segments, to be charged on the full size of the sheet from which they are cut.

For tinning edges of sheets, one or both sides, prices shall be the same as for tinning all of one side of the specified sheet.

Oval Copper Bottoms.

Tinned One Side.

16 oz. to square foot and heavier, per pound.....Base
15 oz. to square foot per lb., advance over base..... ½c.
14 " " " " " " " " " .....1c.
13 " " " " " " " " " .....1½c.
12 " " " " " " " " " .....2c.
11 " " " " " " " " " .....3c.
10 " " " " " " " " " .....4c.
Lighter than 10 oz. to square foot, per pound.....7c.

Round copper bottoms, tinned one side, 8 in. (203.2) diameter to 17 in. (431.8) diameter, both inclusive, 1c. per lb. advance over ovals.

Copper circles, tinned one side, less than 8 in. (203.2) diameter, 3c. per lb. additional.

Copper circles, tinned one side, over 17 in. (431.8) diameter, not classed as copper bottoms.

Polished oval and round tinned copper bottoms, same advance as for sheets.

Copper Anodes or Battery Plates Not Larger Than 20 x 30.

⅜ in. (9.5) and thicker, untrimmed..... lb.
⅜ in. (9.5) and thicker, trimmed to size..... lb.
If drilled, full weight before drilling to be charged.

Nickel-Plated Copper.

Net Cash Prices.

Sheets 14 x 48 (355.6 x 1219.2) Inches.

	Advance over base per lb.	Plating per sheet
14 and 16 oz. and heavier, by the case of 500 pounds and over.....	6c.	40c.
14 and 16 oz. and heavier, less than one case....	7c.	42c.
12 oz. and lighter, by the case.....	8c.	40c.
12 oz. and lighter, less than one case.....	9c.	42c.

Boiler Sizes.

Over 12 (.40) Oz.

By the case of 500 lbs., 7 in. (177.8) (14 x 52) (355.6 x 1320.8).....	6c.	45c.
By the case of 500 lbs., 8 in. (203.2) (14 x 56) (355.6 x 1422.4).....	6c.	45c.
By the case of 500 lbs., 9 in. (227.6) (14 x 60) (355.6 x 1523.6).....	6c.	50c.

For less quantity than one case, add 2c. per lb. 12 oz. and lighter, add 3c. per lb.

Tinning.

For copper nickel plated on one side and tinned on the other, add for
All sizes, per square foot.....3½c.

Note.—The figures in heavy face type in all cases represent metric measurements.

BARE COPPER WIRE—CARLOAD LOTS

26½c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order..... 37c. per lb. base
100 lbs. to 300 lbs. in one order..... 38c. " " "
Less than 100 lbs in one order..... 39½c. " " "

SEAMLESS COPPER TUBING

38 to 41 base.

BRASS MATERIAL—MILL SHIPMENTS

In effect January 3, 1918.

To customers who buy 5,000 lbs. or more per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet.....	$0.28	$0.31	$0.33
Wire.....	.28	.32	.34
Rod.....	.26	.32	.34
Brazed tubing.....	.36	—	.41
Open seam tubing.....	.36	—	.41
Angles and channels.....	.36	—	.41

To customers who buy less than 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet.....	$0.29½	$0.32½	$0.34½
Wire.....	.29½	.33½	.35½
Rod.....	.27½	.33½	.35½
Brazed tubing.....	.37½	—	.42½
Open seam tubing.....	.39½	—	.42½
Angles and channels.....	.37½	—	.42½

[Note.—Net extras for quality for both sections of above metal prices are not quoted due to the fluctuations in the price of zinc.—Ed.]

SEAMLESS BRASS TUBING

35½ to 38½ base.

SEAMLESS BRASS TUBING—IRON PIPE SIZES

35½ to 38½ base.

IRON LINED TUBING—NOT POLISHED

Due to fluctuations of the metal market we are unable to quote these prices.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod..... 33½c. net base
Muntz or Yellow Metal Sheathing (14" x 48") ..30c. " "
Muntz or Yellow Metal Rectangular sheets other than Sheathing .....33c. " "
Muntz or Yellow Metal Rod..... 31c. " "
Above are for 100 lbs. or more in one order.

Metal Prices, April 8, 1918

SHEET ZINC

Duty, sheet, 15%. Cents per lb.
Carload lots, standard sizes and gauges, at mill, 15c. basis, less 8%
Casks, jobbers' prices.....Price on application
Open casks, jobbers' prices.....Price on application
The above prices have been fixed by the United States Government, applying to civilian population of the United States and allied governments, but not for export.

ALUMINUM

Sheet Aluminum, outside market contract base price, 40c. per pound.

98-99% Remelt Aluminum Ingots, outside market, 32c. per pound.

No. 1 Virgin Aluminum Ingots, outside market, 32c. per pound.

Aluminum Rods and Wire, outside market, prompt shipment, 32c. per pound.

EXTRAS FOR ROLLING FLAT SHEETS.

	To 18 Ga.	18-20	21-24	25-26	27	28	29	30	32	34
3 to 26" wide—										
24 to 96" long	Base	Base	.01	.02	.03	.04	.05	.06	.07	.08
97 to 120" "	Base	Base	.02	.03	.04	.05	.07	.08	..	..
121 to 156" "	Base	.01	.03	.05	.08	.10	..	..	..	..
26 to 47" wide—										
24 to 96" long	Base	Base	.03	.04	.05	.06	.08	.10	..	..
97 to 120" "	Base	Base	.04	.06	.07	.08	..	..	..	..
121 to 156" "	Base	.01	.05	..	..	..	..	..	..	..
48 to 60" wide—										
24 to 96" long	Base	Base	.06	.10	..	..	..	..	..	..
96 to 120" "	Base	Base	.08	..	..	..	..	..	..	..
121 to 156" "	..	.01	.01	.10	..	..	..	..	..	..
60 to 68" wide—										
24 to 96" long	Base	Base	.05	..	..	..	..	..	..	..
96 to 120" "	..	.01	.01	.08	..	..	..	..	..	..
121 to 156" "	..	.02	.02	..	..	..	..	..	..	..

EXTRAS FOR STRIP ROLLED SHEETS.

	3-13	14	15	16	18	20	21	22	24
12 to 15 Ga., Inc.	Base	Base	Base	Base	Base	.01	.02	.02	.03
16-17	Base	Base	Base	Base	Base	.01	.02	.02	.04
18-20	Base	Base	Base	Base	.01	.02	.03	.04	.05
21-22	Base	Base	Base	.01	.02	.02	.04	.05	.06
23-24	Base	Base	.01	.02	.02	.03	.05	.06	.08
25	Base	Base	.01	.02	.03	.04	..	..	..
26	.01	.01	.02	.03	.04	.05	..	..	..
27	.01	.01	.02	.03	.05	.06	..	..	..
28	.02	.02	.03	.05	.07	..	..	..	..
29	.02	.02	.03	.05	.08	..	..	..	..
30	.03	.03	.04	.06	..	..	..	..	..
32	.04	.04	.06	..	..	..	..	..	..
34	.05	.06	..	..	..	..	..	..	..

EXTRAS FOR SHEARING.

	12 to 20	21 to 26	27 to 30	31 to 34
Less than 3" to 1½" wide	.01	.02	.03	.04
Less than 1½" to ¾" wide	.02	.03	.04	.06
3 to 30" wide—				
12 to 24" long	.02	.03	.04	.07
6 to 12" long	.04	.05	.06	.08
3 to 6" long	.06	.08	.09	.10

Circles 3c. per pound extra.

GRADE "B" NICKEL (GERMAN) SILVER SHEET METAL

Quality.	Net per lb.	Quality.	Net per lb.
5%	42½c.	16%	47c.
8%	43½c.	18%	47½c.
10%	43¾c.	20%	49¼c.
12%	45½c.	25%	57c.
15%	49c.	30%	62½c.

NICKEL (GERMAN) SILVER WIRE

Quality.	Net per lb.	Quality.	Net per lb.
5%	44c.	15%	52c.
8%	46c.	16%	52½c.
10%	48c.	18%	54½c.
12%	50c.	30%	70c.

The above Base Prices are subject to additions for extras as per list printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are correspondingly higher.

SHEET BLOCK TIN AND BRITANNIA METAL

Sheet Block Tin—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 25 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more, 2c. over Pig Tin. 50 to 100 lbs., 4c over, 25 to 50 lbs., 5c. over, less than 25 lbs., 8c. over.

Above prices f. o. b. mill.
Prices on wider or thinner metal on request.

LEAD FOIL

Base price—5.75 cents per lb.

TIN FOIL

Base price—65 cents per lb.

PLATERS METALS

Platers' bar in the rough, 65c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

PRICES OF SHEET SILVER

Rolled silver anodes .999 fine are quoted at —— above the price of bullion. Manufacturers state that as silver is selling at a premium at the present time they are unable to give any quotation.

PRICES OF NICKEL ANODES

85 to 87% purity.....52½c. per lb.
90 to 92% " .....55c. " "
95 to 97% " .....57½c. " "

Supply Prices, April 8, 1918

PRICES OF SOME METAL INDUSTRY CHEMICALS AND MATERIALS

Acid—		
Boric (Boracic) Crystals	lb.	.25
Hydrochloric (Muriatic) Com., 18 deg	lb.	.08
Hydrochloric, C. P., 22 deg	lb.	*.16
Hydrofluoric, 30%	lb.	.40
Nitric, 36 deg	lb.	.09¼
Nitric, 42 deg	lb.	.11⅛
Sulphuric, 66 deg	lb.	.08
Alcohol—		
Denatured	gal.	1.00
Alum—		
Lump	lb.	.09
Powdered	lb.	.15
Aluminum sulphate, iron free	lb.	.15
Aluminum chloride solution	lb.	.16
Ammonium—		
Sulphate, tech.	lb.	.10
Sulphocyanide	lb.	—
Arsenic, white	lb.	—
Argols, white, see Cream of Tartar	lb.	.75
Asphaltum	lb.	.35
Benzol, pure	gal.	1.00
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate)	lb.	.15
Calcium Carbonate (Precipitated Chalk)	lb.	.15
Carbon Bisulphide	lb.	.20
Chrome Green	lb.	—
Cobalt Chloride	lb.	—
Copper—		
Acetate (Verdigris)	lb.	—
Carbonate	lb.	.40
Cyanide	lb.	.65
Sulphate	lb.	.17
Copperas (Iron Sulphate)	lb.	.06
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.75
Crocus	lb.	.10
Dextrin	lb.	.25
Emery Flour	lb.	.10
Flint, powdered	ton	—
Fluor-spar (Calcic fluoride)	ton	—
Fusel Oil	gal.	—
Gold Chloride	oz.	12.00
Gum—		
Sandarac	lb.	—
Shellac	lb.	—
Iron Sulphate, see Copperas	lb.	.06
Lead Acetate (Sugar of Lead)	lb.	—
Yellow Oxide (Litharge)	lb.	.20
Liver of Sulphur, see Potassium Sulphide	lb.	.15
Mercury Bichloride (Corrosive Sublimate)	lb.	—
Nickel—		
Carbonate, dry	lb.	.80
Chloride	lb.	.70
Salts, single bbl.	lb.	.14
Salts, double bbl.	lb.	.12
Niter (Saltpeter), see Potassium Nitrate.		
Paraffin	lb.	.20
Phosphorus—Duty free, according to quality		nominal
Potash, Caustic (Potassium Hydrate)	lb.	—
Lump	lb.	—
Potassium Bichromate	lb.	—
Carbonate, 34-36%	lb.	—
Cyanide, 98-99½%	lb.	—
Sulphocyanide	lb.	—
Pumice, ground	lb.	—
Quartz, powdered	ton	—
Official	oz.	.73⅝
Rosin	lb.	.08
Rouge, nickel	lb.	.45
Silver and gold	lb.	.60
Sal Ammoniac (Ammonium Chloride)	lb.	—
Sal Soda	lb.	.05
Silver Chloride, dry	oz.	—
Cyanide	oz.	—
Nitrate	oz.	63.28
Soda Ash, 58%	lb.	.08
Sodium—		
Biborate, see Borax	lb.	.15
Bisulphite	lb.	.15
Cyanide	lb.	.37
Hydrate (Caustic Soda)	lb.	.15
Hyposulphite	lb.	.08
Nitrate, tech.	lb.	.10
Phosphate	lb.	.14
Silicate (Water Glass)	lb.	.05
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.35
Sulphur (Brimstone)	lb.	.10
Tin, Chloride	lb.	.75
Tripoli Composition	lb.	.06
Verdigris, see Copper Acetate	lb.	—
Water Glass, see Sodium Silicate	lb.	.05
Wax—		
Bees, white ref. bleached	lb.	—
Yellow	lb.	*.60
Whiting	lb.	.05
Zinc, Carbonate	lb.	.30
Chloride	lb.	.35
Cyanide	lb.	.50
Sulphate	lb.	.12

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base	$65.95
14 " 20 " 64/68 "	"	85.00
12 " 20 " 84/92 "	"	71.95
14 " 20 " 84/92 "	"	93.35

Sewed buffs per pound.

Bleached and unbleached	base	49c.
Colored	"	46c.

FELT WHEELS

White Spanish—

Diameter	Thickness	Price
6 to 9 inch	1 to 3 inch	$2.60 per lb.
10 to 16 "	1 to 3 "	2.50 " "
6 to 16 "	From ½ inch to less than 1 inch	2.80 " "
Over 16 "	Over 3 inch	2.60 " "
6 to 16 "	Under ½ inch	2.90 " "
Under 6 "	¼ to 3 inch inclusive (Net weight shipped.)	3.25 " "
Under 6 "	Over 3 inch (Net weight shipped.)	3.35 " "

Mexican Wheels—

Diameter	Thickness	Price
6 to 9 inch	1 to 3 inch	$2.50 per lb.
10 to 16 "	1 to 3 "	2.40 " "
6 to 16 "	From ½ inch to less than 1 inch	2.70 " "
Over 16 "	Over 3 inch	2.50 " "
6 to 16 "	Under ½ inch	2.80 " "
Under 6 "	¼ to 3 inch inclusive (Net weight shipped.)	3.15 " "
Under 6 "	Over 3 inch (Net weight shipped.)	3.25 " "

*Wholesale price.